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The INDUSTRIAL-ARTS - MAGAZINE -

SEPTEMBER
1921

THE BRUCE PUBLISHING COMPANY
MILWAUKEE - WISCONSIN

VOCATIONAL SCHOOL SURVEY

IS YOUR SCHOOL TEACHING SHEET METAL WORKING OR DOES IT CONTEMPLATE PRACTICING THIS COURSE?

Sheet Metal class connecting forges, State Normal School, Oswego, N. Y.

THE sheet metal industry wants to know how many Vocational Schools there are in the United States teaching Sheet Metal Working.

For compositions on the value and interest of sheet metal work for eighth and ninth grades or for high and normal schools we will forward free gratis a copy of the SHEET METAL PRIMER.

For the best fifty compositions from students, instructors or school supervisors of schools where sheet metal working is being taught we will give away free fifty copies of ESSENTIALS OF SHEET METAL WORK AND PATTERN DRAFTING regularly sold at one dollar and fifty cents a copy.

Class-room photographs and of work accomplished will be appreciated and these in their order will have reproduction in this journal and sheet metal trade papers in the early future.

The list of Vocational Schools in the United States teaching sheet metal working is growing daily and because there are many schools which have been equipped through distributors, it is the object of this survey to receive a more complete list of schools already successfully teaching this course.

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SOUTHINGTON CONN.

INDUSTRIAL-ARTS MAGAZINE

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Outstanding Administrative Problems In Part-Time Education

Prof. D. J. Mac Donald, University of Cincinnati

IT should not seem strange that this new field of educational endeavor has brought with it a new and distinct group of administrative problems. How could it well be otherwise when the type of pupils is inevitably so different? Moreover, does not the employer of the pupil somehow have to be considered in every plan of organization? Finally, can one easily escape the conviction that the subject-matter which more or less satisfactorily meets the needs of the full-time pupil will not satisfy the requirements of the part-time pupil, the one who is employed the greater part of his time. These and many other similar queries were doubtless raised and theoretically answered,—at least by a few, prior to the establishment of part-time education laws. But even so, the recent enactment by twenty or more states of such laws, proved to be a veritable Pandora experience for the majority of school administrators. Naturally, they turned for assistance to such states as Wisconsin, Indiana, Massachusetts, New York, etc., where similar laws had been in existence for a short term of years. But it so happened that their needs could only partially be met through the experience of others, with the result that they were forced to rely largely upon the most primitive, yet the most effective even though expensive method of learning, that of trial and error.

The succeeding paragraphs indicate in detail the outstanding difficulties which administrators in part-time education are battling with and the conclusions, however tentative they may be, already reached by some leading administrators. Such facts as are here offered were gained from what are believed to be entirely reliable sources. As to what constitutes the chief administrative problems, this was ascertained by means of one hundred fifty letters sent to as many administrators in California, Indiana, New Jersey, New York, Pennsylvania, and Wisconsin, all of which states, with the exception of California and New York, had experimented with part-time education for several years. The replies of slightly more than one-third, all who responded, are tabulated below. It is assumed for present purposes that the number of times a problem was mentioned is indicative of its relative importance.

Problems	Times Mentioned
Finding suitable subject-matter	28
Securing competent teachers	21
Gaining the cooperation of parents and employers	20
Providing adequate and suitable rooms	14
Getting the pupils to cooperate fully	11
Maintaining regular attendance	10
Financing the new work	10
Arranging satisfactory programs	8
Providing suitable equipment	6

Some Basic Facts of General Application.

Before proceeding to a detailed treatment of each of these problems, it may be well to call attention to some facts which bear vitally upon the administration of part-time education. The first of these is that the extent to which part-time education will flourish in any locality will depend upon several factors, chief among them being the degree to which the existing high school courses meet the civic and vocational needs of youth of part-time compulsory age. The second is that the average mental age of the part-time group will be considerably below that of full-time pupils of the same chronological age. The degree or extent of this difference will doubtless vary with different localities. Thus the difference would be greater in a predominantly industrial center where, due to economic pressure or other causes, pupils enter the working class at as early an age as possible, than in a place where due to the presence of greater wealth all pupils may attend school beyond the compulsory age.

Authority for this statement is found in figures gathered and interpreted by the Vocational Bureau of the Cincinnati Public Schools. To arrive at a basis for comparison, equal numbers of young persons from the working group and the school group respectively, were given the same mental tests. The medians obtained, on the basis of 100, were 62 for the school group and 43 for the working group. The third is that the amount of school training possessed by part-time pupils will be obviously less than by pupils of the same age

who remain in school. Let this not blind us to the fact, however, that in many instances the practical training gained in commercial and industrial life may be more conducive to mental development than attendance upon school classes. Authority for the above statement is also gained from the Vocational Bureau of the Cincinnati Public Schools. It must be remembered that these figures represent only those who passed through the school employment office in 1919-1920, all told 2,868 of both sexes, the boys' ages being 15-16, the girls', 16-18. One may safely assume that a substantial number of 15-year-old boys who completed the sixth grade and of 16-year-old girls who completed the seventh grade, are not included because they continued in school—this would be especially true of the boys—or because they remained at home after meeting the school attendance requirements. This latter condition would prevail to a considerable extent among the girls.

Time of leaving school—	Per Cent
Before completing 5th grade	2.0%
Upon completing 5th grade	4.7%
Upon completing 6th grade	11.6%
Upon completing 7th grade	18.9%
Upon completing 8th grade	38.7%
Upon completing 9th grade	12.7%
Upon completing 10th grade	9.6%
After completing part of 11th and 12th grades	1.8%

Finding Suitable Subject-Matter.

Whether or not it is true, as one experienced part-time administrator maintains, that "Ultimately the part-time vocational classes must become as varied in subject-matter taught and in supplementary equipment maintained as the commerce, and the trades and industries of the communities in which these classes are conducted," the fact remains that here is found one of the most perplexing of all administrative problems. As for the reason, suffice it to suggest at this time that it may be due largely to the fact that our teachers are trained primarily to use textbooks rather than their heads. The natural result is that when they move into a field where no suitable texts are found, they are at a loss as to how to proceed.

A glance at the following significant characteristics of part-time pupils will shed some light not only upon why it is hard to secure suitable subject-matter but as well upon why satisfactory teachers cannot easily be trained. Their mental age ranges all the way from ten or less to sixteen or more years. Their academic preparation varies from below fifth grade standing to all but graduation from high school. They were for the most part glad enough to leave the full-time school when the law permitted. They not only have little interest in general education but with few exceptions could not pursue it with profit. Because of the very nature of circumstances they must have largely accepted the skeptical attitude towards schools which prevails in business circles. And when there is added to these the statement that fully one-half of such pupils especially in industrial centers, are in jobs for which little or no previous training is necessary and finally the fact that pupils will be entering and leaving classes almost daily, —at least this would be true in the large centers—one has little difficulty in seeing why the regularly trained teacher and the average administrator cannot ordinarily "fill the bill." For this, of all times, is the time when conventional methods, subject-matter and programs are sadly out of place.

How easy it is to state that so far as possible the subject matter of the various courses should correlate closely with the respective occupations of the pupils; but how extremely hard to know what to put into a course when one realizes, as has just been pointed out, that possibly one-half of the pupils are working at jobs which have no teachable content. One thing is certain, teachers in this field cannot afford to underestimate the importance of information such as that gained by the war investigating committee, namely, that of 18,000 jobs analyzed, seventy-six per cent were of such nature that they could be mastered in from one hour to one month of time, the average being ten days. Information of this type should be obtained for every locality. No teacher can safely assume that what is true in this respect in another community, is necessarily true for his or her community. As the writer has said in substance elsewhere (See July number of Educational Review) subject-matter should vary in accordance with the occupation of the pupil. The same material cannot be expected, for example, to meet the needs of pupils from a shoe factory, a silk manufacturing plant, a knitting mill, a bank, a tobacco factory, etc., unless it be the material which has to do with the development of civic intelligence.

The close relationship between our problem and the job analysis movement in commerce and industry is obvious, as is also the fact that part-time teachers and administrators may gain great assistance through affiliating closely with the officials who have charge of such job analyses. Apropos to this are the words of Miss Nellie M. Clark, Detroit Part-Time School, "While the part-time teacher can visit places of employment and so far as possible make instruction apply in the work life of the pupil, any satisfactory program of occupational instruction can be carried out only when surveys have been made of various types of skilled occupations open to girls under 18 years of age for the purpose of discovering the knowledge content of such occupations, the qualifications of workers, and of suggesting courses of instruction."

Indicative of the attitude on this point are the following remarks: "The principal responsibility placed upon the schools by a part-time law is that they eliminate all non-essential material from the subjects of instruction, that they give practical courses a large proportion of which should be vocational in nature, that they adjust the instruction to the needs of the individual student, and that they establish and maintain a close relation with the employment world."

"The academic part of the course of study should be entirely different in its method of treatment from

that which the pupils have been accustomed to in their regular school life."

Possibly the results obtained by the writer in an endeavor to ascertain through conferences with both employers and employees the basis for a practical course in Electrical Theory will be of assistance to others in the field. By the term practical as here used is meant a course that would meet the needs of the ordinary electrical worker, the one who left school before completing the eighth grade, has been working at the trade for from five to fifteen years and has had little if any schooling in the meantime. While the major portion of this information was secured through interview and conference with employers who were asked this question, "Will you kindly record specific instances where your employers 'fell down on the job,' as, for example, made this particular mistake, lacked such and such information, etc.?" some of it was gotten through interviewing the more intelligent and energetic employees. The needs of the employees as revealed by the investigation follow:

They need instruction on the theoretical side, including particularly the calculation of conductors, the principles of electric generators and motors, and a comparison of the characteristics of batteries. With this should be embodied the study of circuits as regards electric lighting and powers, also signal systems such as bells, telephones, etc.

They lack pride in their work. They should have drilled into them that the best, and nothing but the best, workmanship should be tolerated and that it is just as easy to make a neat installment as a poor one.

They lack knowledge of the fittings and appliances to be had, this often resulting in the use of an article or fitting that is not the best one for the purpose.

They lack common sense, i. e., the ability to meet a situation that is a little out of the ordinary, in the best possible manner.

They do not give attention to details; they lack imagination; they do not see the project as it will be when completed. The result is that they do not have the proper materials at hand when they are needed.

They lack detailed knowledge of the latest Rules and Regulations of the National Board of Fire Underwriters for Electric Wiring and Apparatus.

They lack knowledge of the local electric company's requirements for placing meter boards and service conduits. Lack of cooperation between the utility and the men is the cause of no end of trouble.

They should have thoroughly instilled into their minds the idea of accuracy. The method of wiring the ordinary single pole, 3-way and 4-way switches should be known to all electricians worthy of the name, but, nevertheless, numerous "come backs" are the result of misconnections. Such errors are due not so much to a lack of knowledge as to sheer carelessness. In this connection a talk on "Testing Finished Work" might not be amiss.

Ability to read blueprints and interpret specifications intelligently would be a valuable asset.

They should possess requisite skill and knowledge of the shortest methods.

They should be ambitious to become efficient workmen.

They do not estimate what material they will run out of and fail to call up before they run entirely out. This often results in enforced idleness while the needed materials are being taken to the job.

Securing Competent Teachers.

Due to the close connection between this and the preceding topic, many of the statements made there have equal application here. Especially is this true of the statements regarding the wide variability, mentally and vocationally, of pupils concerned. These facts alone warrant the assertion by Superintendent Ford of Santa Barbara, California, that "It will take five years to train teachers to meet the new situation. It is an entirely new problem in construction and teachers trained to the ordinary class methods are slow to grasp the necessities of the situation.

When one examines the list of desirable qualifications for part-time teachers he is almost ready to subscribe to the dictum, "There ain't no sech animal." An enumeration of these as expressed by K. G. Smith, State Supervisor of Trades and Industries for Michigan, follows:

1. He must know the problems of the wage earner.
2. He should have earned his living in at least one occupation other than teaching.
3. He should know the occupations represented by the pupils by observation if not by experience.
4. His primary interest should be in pupils rather than in subject-matter.

Obviously one is placing a large responsibility upon a teacher's shoulders when he asks him to become thoroughly familiar with the problems of wage earners, referring, of course, to those under his supervision. To be sure, there are such teachers both actually and potentially. The difficulty is to get them and train them. In ninety cases out of one hundred it is safe to say, the instruction given must be more or less individual in character and each lesson made a unit in itself. The demands upon this type of teacher, so far as daily preparation is concerned, are well enumerated by O. D. Evans, State Director of Continuation Schools, in Pennsylvania, who says, "that each week's work should be planned in advance, that it should be based upon the teacher's accurate knowledge of the environment and opportunities of the pupil in employment and at home, and that instruction from textbooks be reduced to a minimum, the use of reference books and actual experience being preferred at all times to textbooks."

From whatever angle one approaches the problem, he is certain eventually to come face to face with the fact that not only must teachers prepare unit courses but also well-organized unit lessons. Upon this one point there is uniform agreement. Only those conversant with

teachers and the degree to which they depend upon textbooks, can truly appreciate the difficulties which administrators face when they try to secure or train candidates who can and will meet this requirement. Fundamentally, the none too common traits of originality, resourcefulness, ability to think a new problem entirely through, a liking for pioneer work, an undying yet healthy interest in adolescents must be present, not to mention the many other desirable qualities. Little wonder is it that certain administrators despair of making substantial progress until a new type of teacher can be trained.

Providing Adequate and Suitable Classrooms.

A review of the various replies reveals a failure on the part of school administrators to distinguish between the narrower problem of sufficient and desirable rooms for classes and the larger one of single or dual administrations, locally speaking. There is an unmistakable leaning among the most experienced in this field towards placing part-time work in one or two rather than in many centers in a school system, all such work to be under a special administrator. Thus, Mr. O. D. Evans, recommends that this work "be centrally located and in one center to the end that numbers may justify variety of instructional opportunity." While Miss Clark of Detroit writes that "The success of the part-time school depends upon its being a separate organization in the school system. If fitting it into a full-time school organization is attempted, it will be crowded to the wall, its problems made incidental and its schedule sacrificed. The basis for classification in a part-time school is no narrow adherence to educational attainment according to grade."

Another authority, Mr. R. L. Cooley of Milwaukee, strongly "favors centralizing part-time activities, recognizing that a part-time school can only at best be a supplementary school."

Another factor which must not be neglected in this connection is whether or not separate classes should be conducted for boys and girls. Here again there is difference of opinion, though the weight of evidence is unmistakably on the side of separate classes. Commercial work, it seems, is recognized as an exception to the rule. Just how the plan of segregating the sexes, however desirable and however feasible it may be in the larger centers, can be effectively carried out in the smaller centers is not at all clear to the writer. He is inclined to the belief that the increased cost entailed thereby might make such an arrangement prohibitive. He recognizes at the same time, however, that much would depend upon the manner in which the program is arranged.

A question which has come in for considerable discussion, especially during the past two or three years, is in regard to the advisability of holding part-time classes in classrooms provided by employers. Wide difference of opinion prevails, so much so, in fact, that it is difficult to reconcile the remarks of some with their expressed beliefs regarding the necessity of centralized classrooms. The question at issue is not, it seems, so much that of possible divided authority as of the general morale of the pupils and a desirable environment in which to raise this to the desired level. Whether or not this is a well founded contention, time alone will tell. Suffice it to say that to an interested and critical observer who has seen much of both types of classes, the evidence is overwhelmingly in favor of the school, as contrasted with the shop classroom. The possibility of creating an environment in a shop which is conducive to the development of those more or less indefinable, yet extremely essential, spiritual components of good citizenship, is conceivable; but the same cannot be said of the probability. And when all is said and done, civic intelligence, according to the testimony, is one of the most important objectives in part-time education. The extent to which this is, or shall be true will, of course not be known until the possibilities for providing specific vocational training for various juvenile occupations is ascertained by means of exhaustive analyses of such occupations. It now looks as though a substantial per centage—perhaps even one-half or more—of the occupations of juvenile workers have little, if any, distinctly vocational content. If time should prove the truth of this statement then it goes without saying that the conditions under which part-time classes may be held to advantage will be partially determined thereby.

Getting Pupil Cooperation.

Again and again in the responses the assertion was either directly made or implied that to secure regular attendance from part-time pupils is beyond the range of possibilities. While some school administrators blamed the parents for this state of affairs, others the employers, and still others the pupils themselves, a few were honest enough to admit that possibly the bad taste left in the mouth of the pupil when he was in full-time school, supplemented by the unfavorable daily reports he is getting from his relatives and friends who are still of the compulsory age were playing a prominent part in promoting a spirit of non-cooperation.

Lack of space forbids an analysis of these possible causes. The writer has a feeling that the correspondent who warmly protests against continuing to "picture the part-time school as a nest of young birds greedily opening wide their mouths to devour the worms of wisdom dropped by the teacher" is not far wrong. There will always be a substantial number of young persons who will resent any kind of supervision regardless of its intent or nature. A fifty-fifty arrangement from such as these cannot be expected. They know (?) too much to enable them to be good listeners. They believe that they are qualified to give out rather than to receive information. As a consequence their most vulnerable point is the source of income. This is equivalent to saying, in other words, that if the cooperation of the employers can be gained, the battle is won, provided, of course, other factors involved in the way of suitable sub-

ject matter, a satisfactory program, good teaching, etc., are up to standard. Needless to say, this much-to-be-desired cooperation of the employer cannot be gained through merely asking for it. There are plenty of cases on record where not merely one year but five or even more years were necessary for leading employers to see the advisability of keeping their employees constantly growing. Not only must the campaign be well planned but it must be very skillfully executed if employers, the seeming key to the situation, are to be won over. Normally, these men are decidedly "from Missouri" whenever the schools propose anything. As a consequence they must be shown, not once, but over and over again, the value of such work to them. As one writer puts it, "If we have nothing to give his employees, he will rebel; but if we prove that his employees are better because of us, or that we have helped to solve some of his problems, even the rebellious ones will in time tolerate us." He might well have added "welcome us."

The writer is familiar with conditions in one city where developments have taken place to such an extent that not only do factory officials in normal industrial times ask the coordinator to place boys with them but they have at times earnestly sought information regarding how to secure and retain part-time pupils in their employ. In this same city, it is worth recording, it is not unusual in normal times for the boy of part-time school age to discriminate against employers who will not permit him to attend school four hours per week. (Lest the wrong impression be gathered from the above statement, I add that in this instance pupils are paid for attending school whether it be for four hours per week or for alternate weeks, the weekly wage in the latter case being spread over two weeks.)

The following statements provide a fitting conclusion to this topic, the first being from Mr. Frank M. Leavitt, Assistant Superintendent of Schools, Pittsburgh, Pa. "Of very great importance is the matter of establishing friendly and intelligent relations with the employers of the juvenile workers. This can be done partly through the administrative offices of the continuation school itself but an important adjunct is the vocational guidance and placement office which is maintained in the continuation school building."

The second from Miss Agnes Wolcott, Director of Part-Time Education, Long Beach, California, shows how, in order to create a cooperative interest on the part of employers, parents, part-time minors, in fact everyone, "They formed a citizens' committee consisting of employers, employees and others interested, including newspaper men, to act as an advisory body and likewise as a publicity committee. The employers are represented in part by the Chamber of Commerce and the employees by the Labor Union Council." The third, which by the way brings out one of the points vital to the successful administration of part-time school work, comes from Mr. M. J. Michael, Superintendent of Schools, Kingston, N. J. "One of the most important results comes from the followup work. Our vocational director spends each afternoon visiting the different employers of the members of the part-time school, keeping himself posted with reference to the character of the work they are doing and the effect the school is having on the employee."

Arranging a Satisfactory Program.

The task of arranging a satisfactory school program is complicated enough under ordinary circumstances. But when a third party must be reckoned with, the employer, administrators in both fields agree that the task becomes very much more difficult. Picture a situation like the following—one, by the way, which is not at all unusual—one group of employers swayed by a few who are antagonistic to the part-time movement maintain that they cannot afford to let their juvenile employees off in the forenoon, another group takes the position that since some of their young workers are attending evening classes it is possible for the rest to do the same, while still another group insists upon getting rid of all employees who fall within the compulsory age limit. Increase the number of such possibilities at will—to do so would be no exaggeration of conditions in many cases—and the magnitude of the task of arranging and maintaining a satisfactory school program will begin to loom up. Nor has the important factor of continuous enrollment and dismissal of candidates been duly considered in this connection. All these and other factors, it is pointed out by numerous administrators, cause the program-making task to be exceedingly trying.

What some of the other factors are is indicated in the following statement by two prominent state officials: "Every part-time teacher should be required to devote at least one-fourth as much time to visitation, placement and followup work as to actual teaching."

"The teacher's weekly program involves from 24 to 30 clock hours of followup or coordinating work."

How the task is complicated by reason of the employer is indicated by the following: "We attempted," says the superintendent of schools at Alameda, California, "to avoid Saturday afternoon classes but were unable to since it would have cost more than 40 pupils their jobs." Mr. C. L. Carlsen of San Francisco writes that he can get employees into class in the face of opposition if the classes are conducted near the place of employment. (The convenience of the employer must be the first consideration."

In order to obviate in part the task imposed by reason of new ones constantly enrolling and others weekly if not daily satisfying the requirements and dropping out, some administrators have arranged for a so-called "reservoir" classes into which all entering pupils are placed until classified. It is manifest that providing for such a class in the program would complicate matters still further. But despite all of these objectionable points part-time programs are being made and remade until they eventually approach, if not attain, perfection. It seems to be a case of "Where there's a will there's a way."

In conclusion the writer wishes to quote by way of

summary from the remarks of a businessman what he considers a fair epitome of all the responses received. For in the last analysis the path of the public schools, because of the necessarily closer affiliation with the laboratory of experience occasioned by the establishment of part-time classes, will be far less primrose in character than has been the case heretofore. As someone has well said the test of industry, namely, "put out or be put out" will be increasingly applied as vocational education development takes place. This businessman's statement is: "Do you realize that you are selling education? Do you dare defend its quality as the manufacturer of an automobile will defend his product? You have not had to, but you will not always enjoy this immunity." "Is the taxpayer satisfied? Nearly one-half of the taxes he now pays are for the support and maintenance of education." (This was in an eastern state.) "Will he pay more? Not without protest if the quality remains the same. Change the quality, show the taxpayer that you propose to give him better educational value in exchange for his money, and he will not only pay the bill but will thank you for the opportunity to do so. How do I know? Because I have sold goods and I know how buyers respond to what they want. Why are we paying machinists $60.00 to $80.00 a week and increasing the salaries of teachers only a beggarly $100 or $200 a year? Why, because the public has no confidence in education as an essential industry." (This statement was made in the year 1917.) "Of course the educator does not want to admit it, but the fact is the public, or those who act for it, doubt if the returns received on the educational investment are worth the cost, and to no small degree the public is right."

"When you have thought out an educational policy that is right, that you know is right, and that you can defend against all comers, state it in terms of a program of action that the ordinary citizen can comprehend and then advertise it. Advertise it to those very people who are your prime consideration, create a public demand for your educational commodity, furnish a brand that bears out your advertising, and the public will accept it and pay for it."

The writer cannot but feel that somehow these unvarnished facts are peculiarly significant for administrators and teachers in the part-time field. More than that, he is of the opinion that if part-time school work is reasonably well done it will prove to be the greatest stimulus to general education that it has had for years. Need the inference be pointed out, that if school administrators wish to make their problems of finance easier of solution, they will do well to see that their schools are "sold" to the businessman by and through the quality of product turned out in the chief means of contact, the part-time school?

A Model Steam Engine as a Shop Project

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THE steam engine described below was designed and built for two reasons: First, it was used as a class project in a school located near the main shops of one of our large railroad systems. Ninety per cent of the graduates will find their way into these shops. Obviously, the more these boys know about steam engines the more rapid will be their advancement. Second, the building of the engine afforded a wide variety of work and an opportunity of proving that "Necessity is the mother of invention."

Our shop equipment consisted of an eleven inch lathe and a twenty inch drill press; a power driven emery wheel and a bench with six vises. Other necessary equipments such as drills, reamers, files, chisels, etc., completed our list of tools. We had no shaper, no milling machine, no power hack saw, etc., so that opportunities for demonstrating the uses of the lathe and the necessity of doing lathe work on the drill press were very numerous.

The boys who worked on these engines were all in their second year. Their first year had been spent in carpentry, cabinet making, wood turning and mechanical drawing.

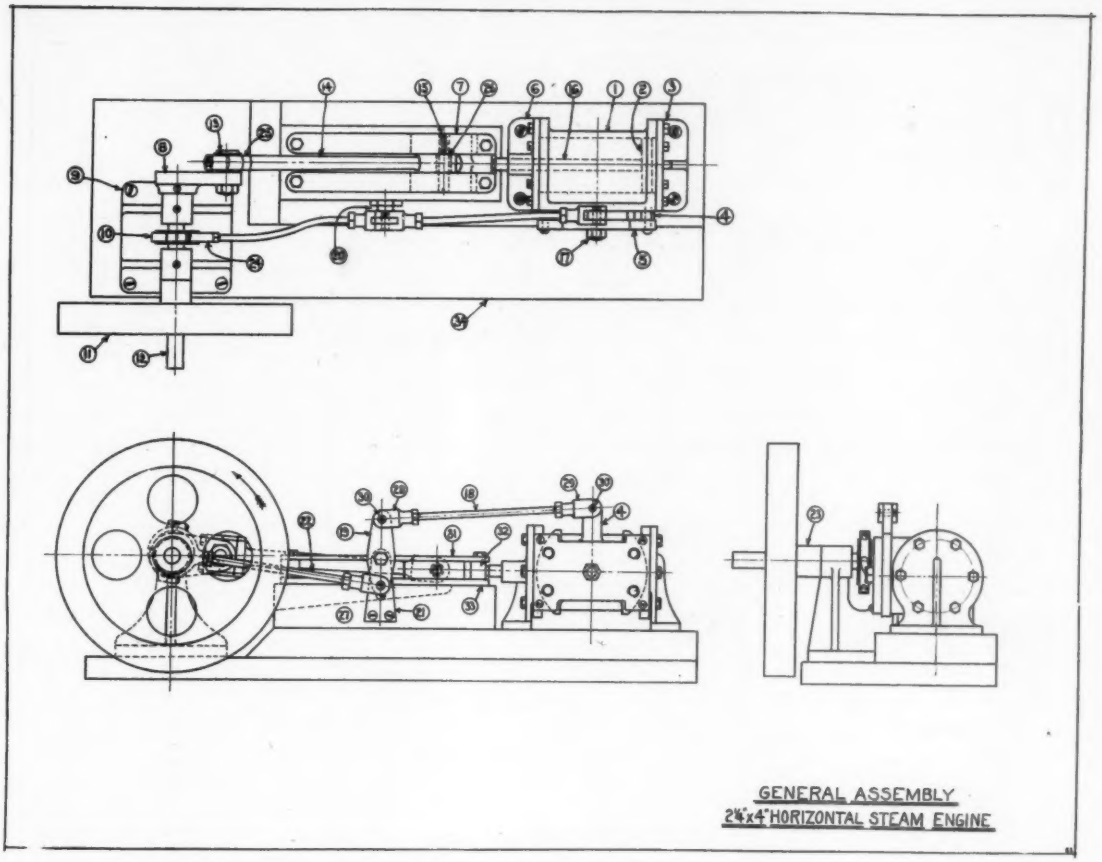
In machining the different parts of the engine no attempt was made to follow any rule for finishing one part after another as necessity required. In turn each boy was assigned a half day at the lathe, about every ten days. To illustrate, each of the ten boys in the class had a number. Thus, when No. 1 had had his half day at the lathe, No. 2 would follow and then No. 3 until each of the ten engine builders had had his half day. Then No. 1 would again have his turn. While the lathe and drill were busy the other boys worked at the bench.

In the following paragraphs I shall not attempt to say which part or parts were finished first, but to explain how each part was finished, naming each operation in its proper sequence.

The Cylinder.

The cylinder of the engine could have been bored on the lathe or on the drill press. The lathe was so small, however, that we decided to bore it on the drill press. This method was also more advisable, because a much better finish could be obtained, and an opportunity was given for the use of some tools which today are seldom thought of or used in the machine shops.

Fig. 3 illustrates how the cylinder was bored on the drill press. A boring bar was used for roughing out. A bushing was inserted in the drill press table to



ASSEMBLY OF THE ENGINE.

Parts for Steam Engine.

No.	Name of Part	Material
1	Cylinder	Cast Iron
2	Piston	Cast Iron
3	Rear Cylinder Head	Cast Iron
4	Valve Plate	Cast Iron
5	Steam Plate	Cast Iron
6	Front Cylinder Head	Cast Iron
7	Cross Head	Cast Iron
8	Crank	Cast Iron
9	Main Bearing	Cast Iron
10	Eccentric	Cast Iron
11	Fly Wheel	Cast Iron
12	Main Shaft	Cold Rolled Steel
13	Crank Pin	Cold Rolled Steel
14	Connecting Rod	Brass or Cold Rolled Steel
15	Cross Head Pin	Cold Rolled Steel
16	Piston Rod	Cold Rolled Steel
17	Valve Plate Stud	Cold Rolled Steel
18	Valve Rod	Cold Rolled Steel
19	Rocker Arm	Cold Rolled Steel
20	Rocker Arm Pin	Cold Rolled Steel
21	Rocker Arm Standard	Cold Rolled Steel
22	Eccentric Rod	Cold Rolled Steel
23	Spacing Collar	Brass or Cold Rolled Steel
24	Eccentric Strap	Brass
25	Connecting Rod Brasses	Brass
26	Connecting Rod Bushing	Brass
27, 28, 29	Rod Ends	Cold Rolled Steel or Brass
30	Rod End Pins	Cold Rolled Steel
31	Cross Head Guides	Cold Rolled Steel
32	Cross Head Guide Blocks	Cold Rolled Steel
33	Cross Head Slide	Cold Rolled Steel
34	Base	Oak Wood

Fig 1.

Fig. 2.

Fig. 3.

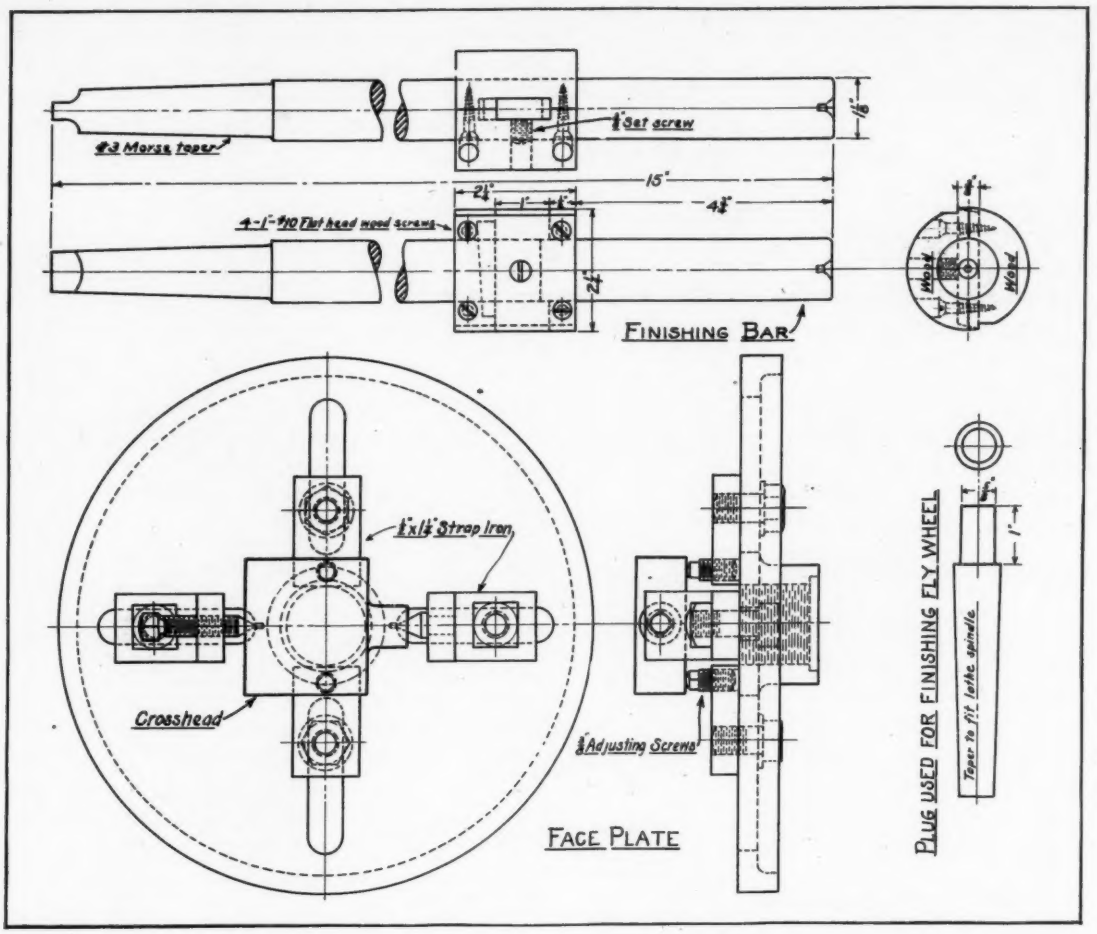


FIG. 4. SPECIAL TOOLS USED IN BUILDING THE ENGINE.

steady the bar while a cut was being taken through the cylinder. This first cut was slightly smaller than the finished dimensions.

After the first cut was through we used a finishing reamer, or boring bar, as shown in Fig. 4. This type of boring bar is referred to above as a tool which is very rarely used at present. Blocks of wood fastened onto each side of the bar and turned to the dimensions required, prevent any vibration or chattering of the cutter and produces a very desirable mirror-like finish on the inside of the cylinder walls.

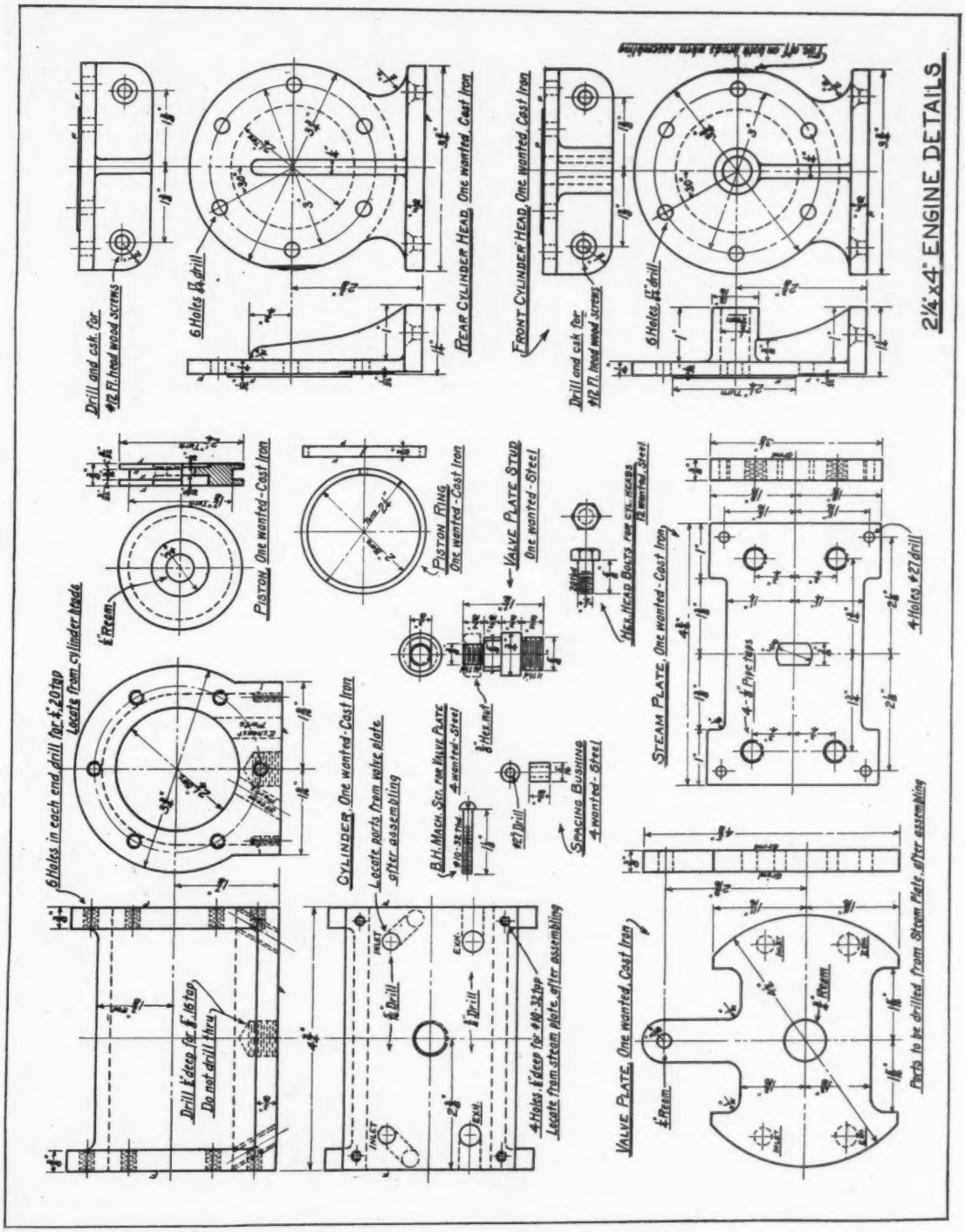
The next operation is to face the ends to the proper lengths. For this operation the cylinder is pressed on an arbor or mandrel and placed between the centers of the lathe. When pressing the arbor into the cylinder, it is well to spread a small amount of oil over the arbor to prevent any cutting or marring of the cylinder walls.

When the ends had been faced, the cylinder was clamped onto the face plate of the lathe, (Fig. 2), for the purpose of facing the valve slide side. Ordinarily this operation would be done on a shaper or milling machine, but our shop had none of this equipment so our lathe had to be used.

The various holes in the ends and side were next drilled and tapped. The end holes were drilled by first laying out the cylinder heads, clamping them in place with a parallel clamp and drilling through each head with a ¼" drill. The heads were then removed and the holes in the cylinder drilled with a No. 12 or a 13/64" drill.

The next hole drilled was that in the valve slide side for the valve plate stud. This hole was drilled with a 17/32" drill and tapped out with a ⅝" tap. Extreme care must be taken when drilling this hole to avoid drilling through the cylinder wall. When this hole is drilled and tapped, screw the valve plate stud in place and assemble the valve plate and steam plate. Lay out the holes on each corner of the steam plate and drill through with a No. 18 drill. Remove the valve and steam plates and drill the holes in the cylinder ½" deep with a No. 28 drill and tap with an 8/32" tap.

The drilling of the port holes was the very last thing done on the engine. The position of each hole was laid out on the steam plate and the entire engine with all working parts was assembled. The fly wheel was turned until the piston was at the extreme end of


2¼ x 4" ENGINE DETAILS
Drill end cst. for #12 Fl. head wood screw
6 Holes #4 drill
Rear Cylinder Head. One wanted. Cast Iron
Front Cylinder Head. One wanted. Cast Iron
Drill end cst. for #12 Fl. head wood screw
6 Holes #4 drill
Piston. One wanted - Cast Iron
Piston Ring. One wanted - Cast Iron
Valve Plate Stud. One wanted - Steel
Hex. Head Bolts for Stm. Head. 2 wanted. Steel
Steam Plate. One wanted - Cast Iron
4 Holes #27 drill
4 - ¼" Pipe taps
6 Holes in each end drill for ¼"-20 tap. Locate from cylinder head.
Cylinder. One wanted - Cast Iron
Locate ports from valve plate after assembling
B.H. Mach. Scr. for Valve Plate. 4 wanted - Steel
#10-32 thd.
#21 Drill
Spacing Bushing. 4 wanted - Steel
Valve Plate. One wanted. Cast Iron
Ports to be drilled from Steam Plate after assembling
Drill ¼" deep for ¼"-16 tap. Do not drill thru
4 Holes ¼" deep for #10-32 tap. Locate from steam plate after assembling
INLET
EXH.

the forward stroke and then clamped in place. The inlet and exhaust ports for this stroke were then drilled through the steam plate and valve plate and for a short distance or approximately ⅛″ into the cylinder. After these holes were drilled, the fly wheel was unlocked and rotated in the opposite direction, or to the extreme end of the reverse stroke and the port holes for this drilled as described above.

The cylinder was then removed from the engine and placed on the jig as shown in the drawing, and the port holes drilled through. The inlet ports were drilled at an angle of 30 degrees and the exhaust ports were drilled straight. This was to allow any condensed steam which might enter the cylinder to escape easily. The inlet ports were drilled with a 5/16″ drill and the exhaust ports with a ⅜″ drill.

The successive operations are: (1) Rough bore to 2-7/32″ diameter; (2) finish bore to 2-¼″ diameter; (3) face the ends to the right length; (4) face the valve slide side; (5) drill and tap screw holes in the ends; (6) drill and tap a hole for the valve plate stud; (7) drill and tap holes for steam plate screws; (8) drill port holes; (9) scrape and finish the valve slide side.

Steam Plate and Valve Plate.

As will be seen in the assembly drawing, two plates were used in the valve mechanism. One was a movable plate, which we called the valve plate, and the other was the inlet and exhaust of the steam. The outer or stationary plate we called the steam plate.

The valve plate was finished in the following manner. A 23/32″ hole was laid out, drilled through the center of the plate and reamed with a ¾″ reamer. Care must be taken to have the plate lie flat on the drill press table when reaming the hole.

An arbor was pressed into this hole and placed between the centers of the lathe. The sides were faced off to the proper thickness and the lathe work on this part was finished. The ¼″ hole in the arm was drilled and reamed, but the four valve holes were not drilled until the entire engine was assembled. The valve plate was ground with pulverized emery and oil after all other work had been done. By rocking the plate back and forth in the way that it was to run, a smooth flat surface was obtained. If care is taken when facing the plate, time can be saved in grinding it.

Steam Plate.

The steam plate was finished by grasping it between the jaws of the lathe chuck and facing off the inner side. The holes for the inlet and exhaust pipes were drilled and tapped out. The center hole was worked out to shape by first drilling two 5/16″ holes on 5/16″ centers. The remaining metal was chipped out and the hole was filed to fit the valve plate stud. The steam plate was screwed into place on the cylinder and this was also ground to a true bearing surface with the valve plate.

The operations for the valve plate are as follows: (1) Drill and ream a ¾″ hole; (2) face to the required thickness; (3) drill and ream a ¼″ hole; (4) grind to a bearing surface on the cylinder.

The following operations are for the steam plate: (1) Chuck up and face one side; (2) drill and tap steam pipe holes; (3) drill corner holes; (4) drill, chip and file the center hole; (5) grind to a bearing surface.

Cylinder Heads.

The first operation on the rear cylinder head was to chuck it up true in the lathe chuck and face off the inside. Next cut back 1/32″ to 2-¼″ diameter. This forms a small projection or boss which will help to centralize the head on the cylinder. Lay out and drill holes.

The front cylinder head was finished in the same way as the rear with the exception of the hole for the piston rod. When the front head was faced a 7/16″ hole was drilled through the center. A small boring bar was used to true up the hole, after which it was reamed with a ½″ reamer.

The successive operations for the rear head are: (1) Chuck up true; (2) face the side; (3) under-cut the side 1/32″ deep to 2-¼″ diameter; (4) lay out and drill holes.

For the front head the operations are: (1) Chuck up true; (2) face the side; (3) under-cut the side 1/32″ deep to 2-¼″ diameter; (4) drill, bore and ream the hole; (5) lay out and drill holes.

Valve Rods.

Two of the most simple parts of the engine were the valve rods. These were made from ¼″ round cold-rolled steel. When the length of the valve rods was determined they were cut from a long bar and a hand die was used to thread each end to the required length.

Spacing Bushings.

Between the cylinder and the steam plate, small bushings were required to prevent the valve plate from binding. These were made by chucking up a piece of ⅜″ cold-rolled steel and turning it to 5/16″ diameter. A No. 27 drill was used to make the hole while the piece was still in the chuck. The pieces were cut off to the proper length with a parting tool. The burrs were filed off and fitted to the exact length when the valve mechanism was assembled.

Valve Plate Stud.

The best method for finishing this part is to center both ends and finish the stud between centers. The operations are as follows: (1) Center both ends; (2) face both ends to the correct length; (3) rough turn to ¾″ diameter; (4) rough turn to ⅜″ diameter ⅝″ from the end; (5) under-cut cylinder end to ½″ and rough turn to ⅝″ diameter; (6) finish turn all dimensions and square up all shoulders; (7) cut threads on ⅜″ end; (8) cut threads on ⅝″ end.

In cutting these threads on each end it is best to cut the thread on the ⅜″ end first and fit a nut, then follow the same method as described for the piston rod.

Piston Ring.

The piston rings for the engines were made up in one lot of twelve rings from a single casting. A hollow casting was made up for this part of the engine and the best mechanic in the class was chosen to do this job.

The outside and inside diameters were first turned and the rings were cut off to the desired thickness. When cutting off each ring, the face of the casting was first trued up smooth before cutting another ring. By doing this it was necessary to face only one side after cutting off.

After the rings had been faced to the proper thickness, they were sawed on an angle of 30 degrees and the proper amount or approximately 3/16″ of metal sawed out. The ring was then fitted into a compression jig and a special arbor was used to finish the outside diameter.

The necessary operations are as follows: (1) Chuck up true; (2) turn outside diameter; (3) bore inside diameter; (4) cut rings to thickness; (5) face the opposite sides of the rings; (6) saw out 3/16″; (7) fit in the compression jig, then turn outside diameter.

Piston.

The piston was grasped in the chuck and a cut taken off one side. The hole was then drilled, bored and reamed to a ½″ diameter. The next operation was to counterbore one side to ¾″ diameter 3/16″ deep. It was then removed from the chuck, pressed on an arbor and turned to size. The opposite side was faced to the required thickness and a 3/16″ groove was cut in the center for the piston ring.

The operations are as follows: (1) Chuck up true; (2) face one side; (3) drill, bore and ream a hole for the piston rod; (4) counterbore for clamping nut; (5) press on the arbor and turn outside diameter to size; (6) face the opposite side to size; (7) cut a groove for the piston ring.

Pioneering In Manual Arts Teaching In China

F. A. FOSTER

(Conclusion)

Some Chinese Tools.

Fig. 16 shows some Chinese planes and some modifications introduced for their improvement. The feature of the Chinese plane that attracts attention at once is the handles which are at the sides instead of on top. The handles shown on the planes *A* and *B* have two tenons fitting into mortises in the sides of the body. Fig. 17 shows a detail of the handle. In order to put the handle onto the plane the handle is split along the line *ab*, just above the tenon. The tenons are glued into the mortises and the split handle glued together.

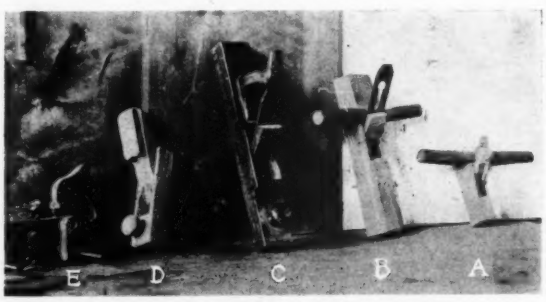


FIG. 16

Figs. 16-a, 16-b, 16-c, show some other forms of Chinese planes and their peculiar handles. Fig. 19 shows some Japanese planes which had been used at the school by a former teacher, either a Japanese or a Chinese who had had Japanese training. These have no handles and are intended to be pulled toward the workman instead of pushed away. Another feature of these planes is that the cutters are not held by a wedge but are dependent on the tightness with which they are held in their grooves by friction. There is no cap iron. The Chinese planes have the throat opening at the middle of the bottom instead of well forward as on American planes. This probably gives a better balance for their way of holding the plane. Chinese planes are generally narrower than American ones of the same length. One and one-quarter inch to 1½″ are the usual widths. Belgian or French plane irons are quite common but are seldom used with a cap iron. A wooden or iron pin is usually put through the body near the top of the throat for the wedge to press against.

The wood used for Chinese planes varies in different localities. Teak, walnut, locust, ash, oak, and date wood are used. The date is not that of the date palm but a tree bearing a fruit greatly resembling the common date. The wood of the date tree, called "tsao mu" is extremely hard, heavy and richly colored, resembling lignum vitae. The planes made for the first class, by a local carpenter, were of unseasoned locust, and were so poor that it became necessary to have new ones made. This gave an opportunity to introduce a new and better type, shown in Fig. 22-C. This found special favor with the students because, the handle being at the top, (an adaptation from the American) the student did not scrape his knuckles on the work, as happened occasionally with the handles at the side. The wood selected for these new planes was a yellow walnut, called "huang tan mu," very hard, clear and straight grained and capable of taking a high polish.

Fig. 16-D shows a block plane having the handle and wedge all in one piece, evolved to take the place of the Chinese block plane shown in Fig. 16-A.

Needing some rabbit and moulding planes for cabinet and furniture work, an attempt was made to have the students make a combination plane of wood adapted from the iron combination plane made by a well known American firm. Fig. 16-E shows the plane as drawn and made by every member of the first class. A few small parts were made from brass castings, locally made and the extension rods were of bar iron polished. The wood was the yellow walnut. The thumb screws were made from large wood screws with the wings brazed into slots cut with a hack saw. In order to have the holes for the set screws a good fit and full thread in the extremely hard wood, a tap was made from one of the screws by filing three flutes and filing off the thread at the small end to the bottom of the thread for a leader or pilot. A square was filed on the head end for a tap

wrench. The holes made by this tap gave a full thread and were very durable.

Chinese Saws.

The saws used by the Chinese woodworker are of the frame type. The blades of the smaller sizes are often of Belgian or French make, although some are

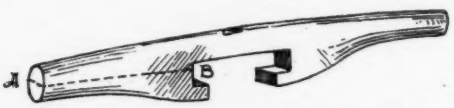


FIG. 17 Handle of a Chinese Plane

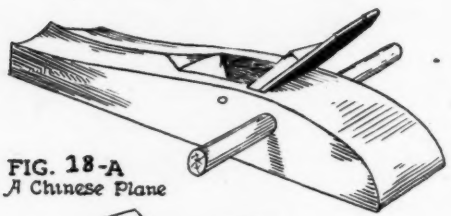


FIG. 18-A
A Chinese Plane

FIG 18-B
A Chinese Plane

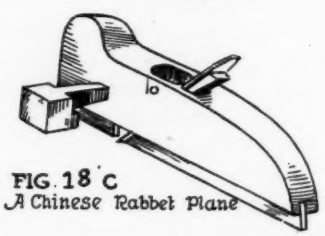


FIG. 18 C
A Chinese Rabbet Plane

manufactured locally. The larger ones used for sawing logs into planks and boards are all made locally and have the teeth of one half facing in the opposite direction to the other half, as shown in Fig. 20. When it is desired to build a house or to get boards for any woodwork in sufficient quantity, the logs are usually brought to the premises and sawed up there. Fig. 21 shows boards being sawed from a log by one of these large frame saws. It is seldom that the sawing is done sufficiently in advance to allow the boards to become thoroughly seasoned. They have no good method of drying wood as it is done in an American dry-house. Their way of drying boards is to dig a pit nearly as long as the boards. In the bottom of the pit a fire is made, often with sawdust, and when there is a good bed of coals or a smouldering fire, the boards are laid over the pit and occasionally turned over to dry. Needless to say this process is not a thorough one. Much of their work develops cracks and open joints as the wood gets dryer.

A very interesting fret saw is shown in Fig. 22.

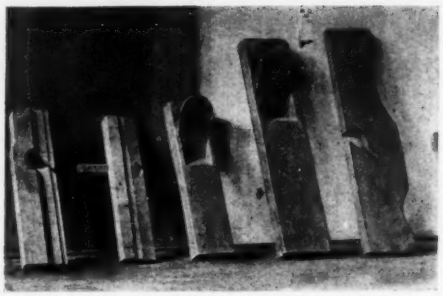


FIG. 19.

The frame is made of a strip split from a section of bamboo and bent into a bow. The blade is made from a piece of *round* steel wire fastened by winding it around the ends of the bow. The teeth are made by laying the wire across the corner of the bench, after it is stretched, and cutting the teeth with a hatchet or a heavy chisel. This makes a surprisingly efficient blade and is quickly prepared. Fairly thick soft wood can be

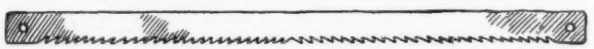


FIG. 20 A Chinese Saw Blade Used in Sawing Logs into Boards

cut with such a saw and they cut out some quite complicated fret work in China.

Fig. 23 is a carpenters' inking line, pot and marker. The body of the one shown was made of horn. Others are made of wood. The body is filled with cotton saturated with a black ink mixed with water. The end of the line usually has a hook for attaching to the board or log to be marked. The line wound on the reel has to traverse the wet inky cotton when it is drawn out. The marker is dipped into the cotton and used as a pencil

FIG. 21.

for squaring lines, etc. In marking a log for sawing into boards the ends are squared off and the lines for the thickness drawn across the ends while the log is lying horizontally, so that the lines can be "plumbed" and so be parallel on each end. These lines on the ends are then connected by "snapped" lines which furnish a guide for the sawyers when the log is inclined or set on end as shown in Fig. 21.

Boring Tools.

The Chinese seem to be rather deficient in good boring tools. Fig. 24-A-B shows a common carpenter's bitstock or drill. This is used for drilling holes up to about half an inch diameter. For a larger hole than that two men are required, one to hold the drill while the other works the "fiddle bow" or strap wound around the spindle. For larger holes they often require two men to pull, one at each end of the strap. Such a drill can be seen on the end of the bench in Fig. 4. Time, however, seems to be a small consideration with the average Chinese workman. The motion of the drill being reciprocal, cuts only half the time. American bits and bitstocks were introduced in the work of the school and are beginning to be much appreciated by the native workmen, who, by the way, are quite keen to appreciate the good points of any tool. The greatest drawback to the introduction of many of the foreign tools seems to be the high cost compared with the wages the workman receives. The average workman is getting good pay if he gets thirty to forty cents (U. S. money) per day. In Fig. 25 is seen another type of driller called a "pump" drill used for drilling metal or small holes in wood. This can be seen in use in Fig. 5. The spindle has a sort of balance wheel at the top and gets its motion from the cross-piece handle through which the spindle passes. The handle is connected to the spindle by small straps which are wrapped around it. The downward motion of the handle must be stopped quickly before the straps are quite unwound and quickly reversed so as to allow the balance wheel to wind the straps around the spindle in the opposite direction.

The drills or bits used in the Chinese bitstock are usually made with a tapered square shank and, in the case of smaller sizes, are made with a wooden shank into which a wire nail is driven and the end of the nail hammered to an acutely flat pointed end a little wider than the diameter of the nail, at the widest place. See Fig. 24-A.

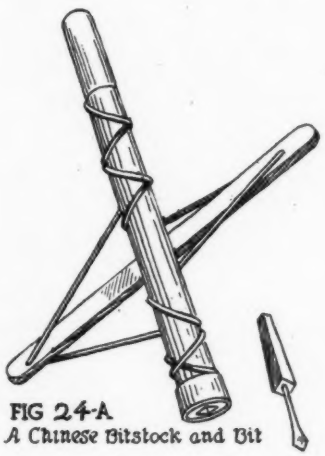


FIG 24-A
A Chinese Bitstock and Bit

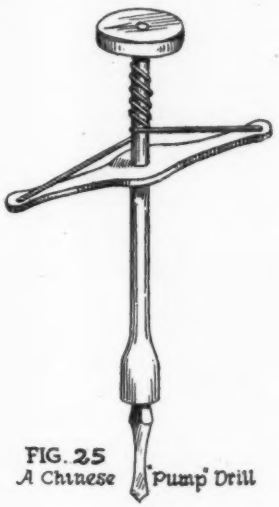


FIG. 25
A Chinese "Pump" Drill

FIG. 23
A Chinese Woodworkers Marking Line and Pencil

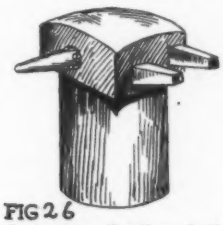


FIG 26
A Chinese Anvil with the Horn as a separate Piece Wedged in

FIG 24-B
A Chinese Bitstock

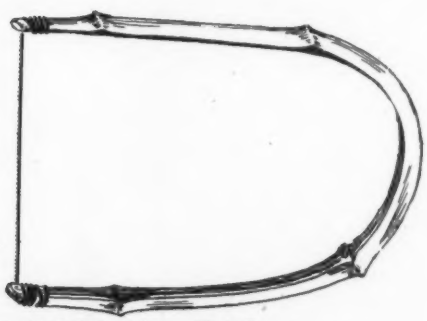


FIG. 22 A Chinese Fret Saw of Bamboo and Wire

FIG. 27
A Chinese Blacksmith's Hammer

Blacksmith Work.

Blacksmith work was introduced toward the end of the course of the first class. The tools used by the Chinese blacksmith are in many respects similar to those used in America. The hammer used by some of the blacksmiths is somewhat different from ours in that the head is made decidedly oblong instead of round. See Fig. 27. The anvil is often lighter than an American anvil and is hollow to fit onto the top of the block.

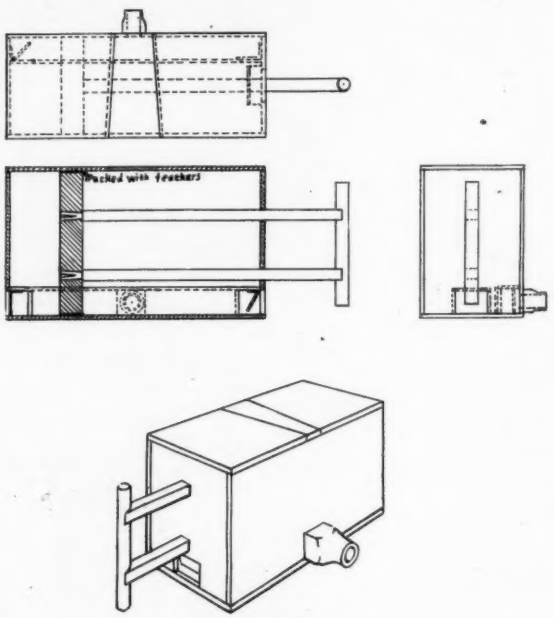


FIG. 28.

The forge is usually built up of brick with a clay tuyere across which a few small round iron rods are laid for a grate. The fire bakes the tuyere into a brick. The blast is usually obtained by means of a "wind box" similar to that shown in Fig. 28. The handle connects to a piston fitting easily in the box and packed with feathers glued to the outer edges to make it air tight. Inlet, flap valves at each end permit air to be forced with both strokes of the piston. This makes quite an efficient blower and is used very extensively throughout China. Such blowers are often used in the native foundries for the cupola blast. When used for such a purpose they are often made with a five-foot stroke and require four or five men to operate them.

Chinese Students.

To one who can enter the work of teaching manual arts with interest in the student as a leading stimulus, the work in China is attractive. The students seem to respond to the efforts of the teacher satisfactorily and the average Chinese young man is not so very much different from his American brother. The Chinese students have a power of concentration on their work that is not equaled by our American boys. At the Chihli Higher Normal College, one peculiar feature which is a survival of the old customs, is that of studying aloud. A class of students occupying a study room in the evening resembles pandemonium for each student is studying his lesson aloud as unconcernedly as though alone.

The Chinese students are keenly interested in the transformation of their country to meet modern conditions. Those who take up manual arts are especially strong factors in the future development of the country. A strong students' union has been established throughout the country for the purpose of bringing about reforms and the establishment of better government. The strength of the organization was given a good test last year when an attempt was made to throw off the influence of a certain country in government affairs. An extensive boycott was inaugurated and considerable accomplished in bringing the political danger before the people. Schools were closed for some time and the students went out around the country and in the city streets explaining to the people the situation and developing a stronger feeling of unity and patriotism among them.

An interesting feature of the work was the part that some of the students of manual arts took in many of the cities. While the schools were closed and during the summer vacation, many of the students spent their time in teaching the guild workmen new ways of doing work which would enable them to make some of the simpler things that hitherto have been imported from a neighboring country. This attitude of helpfulness is much to be commended.

On the whole it may be said that manual arts is making gratifying progress and is bound to have a far-reaching effect on the country in the years to come. Although there is not the financial backing that there should be, it is being more and more recognized as an important work. Often the lack of funds leads to restricted plans of the teacher, but it also puts him on his mettle to meet the restricted course by some home-made device of his own, giving a zest that can only be appreciated by those who love the work.

WET STICKS*

A Fable For All Teachers, Art or Otherwise, Who May Have Discovered "Wet Sticks" In Their Own Classrooms or Workshops

G. S. Twichell, Fitchburg, Mass.

ONCE upon a time there were two men who were called upon to do a certain task for their master. This task was to make a fire, using the material which the master provided for the purpose. Now it happened that these two men were equally skilled in certain lines of work, and the master said, "Certainly they will do equally well at this task which I have given them." And he left the material and went away. It also happened that the men were given different places in which to work, both places however, being equal in everything except exact location, which was a small matter anyway.

After the master had gone away, leaving his instructions, they set to work to make their fires, although neither knew how the other was working, as they were separated by a high wall. The first man commenced to hum at his work, thinking that it would be fun to build a nice fire and please the master. He looked over the material which had been given him. It appeared to be ordinary wood of various lengths and sizes, and he started to make up the fire.

"Aha," he cried, as he picked out some nice, dry sticks, "I am sure I can make a fire to please the master because this wood is so nice and dry, and just the right kind to burn brightly." And he commenced to whistle a gay tune as he laid the sticks together and started them burning. Soon, however, he saw that some of the sticks were much too long, and he carefully cut them so they did not take more room than necessary. Then he noticed that several of the sticks were wet and would not burn at all. He stopped whistling and thought for a minute. "Wet sticks will not burn," he mused. "Now the master knew that, and why should he ask me to make a fire from that which will not burn?" He puzzled a while longer, then suddenly his brow lightened. "Why should I waste time questioning the master's orders? He told me to make a fire from the material which he gave me, and that is enough for me to know."

"Dry wood burns," continued he, "therefore I will make dry wood of the wet sticks and then they will burn." And he forthwith gathered then up carefully. The too long sticks he cut to the right length and the crooked sticks he trimmed off so they would not interfere when laid on the fire. He picked out the brightest and hottest spots in the fire and laid the wet sticks above the bright ones.

"Now," he said, "if these sticks were ever meant to burn, they will commence to burn after they are dry. I have placed them where the heat from the burning sticks will dry them, and I think they will begin to burn themselves in a little while." Soon they commenced to steam, and smoke a little, and the workman found a slight frown gathering on his forehead, and he stopped whistling for an instant.

"Ah, me," he sighed, "steam and smoke do not make a good fire," and he looked more closely. The wet sticks had commenced to dry.

"Aha," he laughed, "it is only the wet sticks. They are beginning to dry, and of course they will steam and smoke a little, but this isn't really doing my fire any harm after all. The dry sticks are burning just the same, only I could not see for a moment through the steam and smoke." And he carefully moved the drying sticks around into places where they would dry still faster. In a little while longer, he again started whistling gaily as he discovered that some of the sticks were dry and had commenced to burn. They did not all burn as well as the dry wood, but still they were really burning and others were drying. And as he watched them with a smile on his lips, he was delighted to find that some of the wet sticks gave off little flecks of color and light every once in a while, making them even more interesting to watch than the dry sticks which burned steadily along.

"Ho, ho, little wet sticks," he cried, "you have been through different places from those which your brother sticks have visited, and have gathered up some things which the dry sticks have not. You were never meant to start a fire with; you must have been meant for some other use. However, the master brought you here and therefore there was a reason for using you. Now that you are dry you help make the fire a little bigger and warmer, even if you do not make a big crackling blaze like the dry sticks." And he again moved them carefully near the hottest part of the fire so they would dry still better. At last the sticks were nearly all burning, and even the wettest ones were drying. Then the workman sat down to rest. "The wet sticks were never

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*A few of the "whys" for this article.

In industrial work in the West. A young man taking placement training under the Federal Board was reported by the shop foreman as being "absolutely no good, and I won't bother with him any more." The man was transferred to another shop doing exactly the same line of work and later reports came in that he was doing fine and was going to be one of their best workers.

In an art institute in the East. An instructor was so unwilling to allow any but those of exceptional talent in his class, and so outspoken in his condemnation of those he considered of "no ability," that six pupils in one class, a specially talented group, changed their plan of work and entered another department of the institute rather than continue study with him. A majority of the others cut class as often as they dared, running the risk of not getting a passing mark rather than work in such an atmosphere of criticism and partiality.

In hospital training of ex-service men in the South. A half dozen especially "difficult" cases where men were considered "triflin'," unapproachable or useless to try to interest in either occupational or vocational work, have been brought back to earnest study or work by certain teachers who refused to believe the general opinion that the men were "no good." The teacher's attitude in the rehabilitation work is especially pronounced in its effect upon the men.

meant for fire-wood," he said, "but I have done my best with what the master gave me."

The other man, while all this was going on, had started to make his fire, cheerfully picking out the round dry sticks and putting them in place. Then he lighted the fire. The sticks blazed up bravely. Toward the bottom of the pile, however, he found an armful of wet sticks, some of them much too long, and not of good shape for the fire.

"Hum," he cried, "what is all this wet wood doing here? The master knows that wet sticks will not burn. But he said to use it all, so I suppose I must." And with that he threw the wet wood on top of the fire so suddenly that it knocked some of the burning sticks off. This angered him and he kicked the burning sticks back into the fire and snatched the wet wood off.

"What is the use of trying to burn that old stuff?" he muttered. "It never was meant to burn, and it is just putting out the rest of the fire." Then he looked at it again and picked up one or two sticks which seemed to be not so wet as the rest and tossed them back on the fire where they commenced to steam and smoke. The other sticks were some of them very long and he threw them one side without attempting to either cut them down or dry them.

"What is the use of trying to dry them?" he argued with himself. "It takes too long and I have to attend to the good sticks which will burn." Then suddenly he noticed a nice dry stick which was burning brightly at one end but had a branch sticking up from one side which got in his way when he went to pile on more sticks. He snatched this out of the fire and stamped on the burning end until the fire was out. Then he tried to cut off the branch, but it was hard wood, and he soon tired of trying to cut through it, and tossed it to one side. In doing this one end of the branch hit a wet stick and flung it against him. He reached down for the wet stick and threw it angrily over the wall. (A few minutes afterward, the first man found it, dried it carefully, and added it to his own fire, making it that much bigger.) The other wet sticks this second man tossed one side also, and again picked up the dry stick with the branch on it.

"This stick is one of the best kinds to burn," he muttered, "but that branch is upsetting all the rest of the fire. I suppose I will have to use it however, as the fire doesn't burn as well as it might." And so he threw it into the edge of the fire in such a way that only the end was charred and finally stopped burning altogether.

While he had been throwing the wet sticks away and groaning and muttering because the wood was wet, and even the dry sticks had branches on them, the fire had begun to die down for lack of care and only the biggest and driest sticks were burning. These had a good start and would burn without further attention, in fact, even if the man had tried he could not have stopped their burning.

All at once the high wall between the two men vanished and the master stood between them. He looked in silence at each man's fire, and then commenced to speak.

"You both had the same task given you—the conditions were the same and the wood was carefully given out in the same proportion of wet and dry. Some of the wet sticks will never burn, but they can be used for something else after they are dry. The dry sticks would burn anyway, if the fire was started. Anyone can make a fire with good wood. This first man has not only made a fire, but he has carried out my directions to use *all* the material I left you. Even if all the wet sticks did not burn, he has dried them so they may be now used for something else equally as valuable as for making fires. All wood was not intended for fire-making, and the good workman does not condemn and throw away material just because it is not suited to his own immediate needs. You"—he turned to the second man, "have not only thrown away material which is valuable to someone else for other purposes, but you have neglected the rest of the fire while you were complaining, and half of the fire has already died down. You have made a fire, it is true—thus far you have carried out my orders. I give you full credit for whatever you have done, but further than that I will not go. You have obeyed but a small part of my instructions and I shall have no further use for your services hereafter."

Turning to the other man he said, "You have obeyed my instructions to the fullest, have shown yourself careful in the use of another's goods entrusted to your care, and have withal kept cheerful in the face of difficulties. I have more and still greater work for you to do, and your reward will be in proportion to the work."

And the second man remained with the master and was happy.

The question of Art is altogether a question of social reform. Art must grow out of the life. If the life is not so ordered that Art will appear as its crown and fulfilment it is idle to foster and upbuild it. To give it independent development is to preserve the empty form and overlook the vitalizing spirit.—*Oscar Lowell Triggs.*

Industrial Work In The Junior High School

A. F. Benson, Principal Jordan Junior High School, (Bremer) Minneapolis.

IN discussing the industrial work in the junior high school, I am keeping in mind the fact that there are people who sincerely believe that our schools should do little, if anything, in any other line than the socalled purely cultural work of the traditional school. We will not attempt at this time to answer directly any of their arguments. Their number is becoming less and less as the days go by.

The junior high school recognizes, possibly more fully than any other educational organization at the present time, the place of industrial experiences, paralleling the purely academic experiences during the early adolescent period of a boy's or girl's development.

Perhaps a better term than industrial work would be the term "motor activity" but we shall use the accepted term "industrial."

A boy of the junior-high-school age is not ready to select his life's work, along either industrial lines or the more strictly professional lines. The business of the junior high school in both its academic and industrial departments is to push back the horizon line so that the boy may be constantly getting a new view of himself in relation to the world conditions with which he finds himself surrounded. With this view of school work, the teacher of mathematics or of geography is just as much a prevocational teacher as is the teacher of printing or of cabinet making. In a very definite way, every teacher of a junior high school is, and should be, an educational-vocational guide.

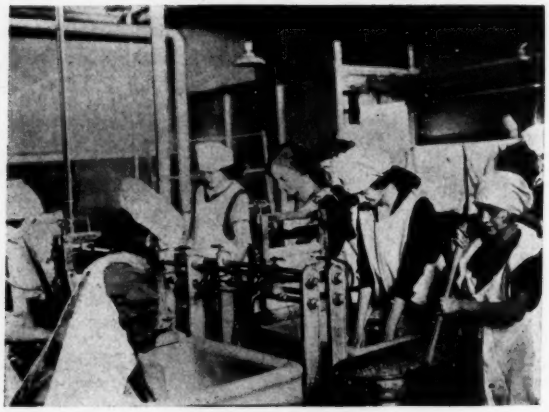
Unfortunately when the industrial work of the junior high school began to be prominent, it was largely with the vocational or trade idea in mind. In fact some of our junior high schools were almost cast upon the rocks because of this idea. At the present time there are few, if any, junior high schools that have not abandoned the trade or vocational idea in their industrial department. It is true, however, that with a few individuals the industrial work will assume more and more of the trade idea but these cases are individual and need not be considered in our discussion at the present time. In considering the industrial work of the junior high school we now use the word prevocational. This, it seems to me, is the correct term to use but I do wish the term prevocational would be applied to the academic department of our junior high schools as well as to the industrial department. Music if rightly taught is prevocational. It can also be taught from a vocational point of view. In all of the work of the junior high school, the pupils must work with worth while material and the application must be present and not future. The chief difference between a junior high school and a senior high school lies in the fact that in a junior high school we are working with present and not in deferred values.

HOME MECHANICS CLASS

SHEET METAL SHOP.

The number of different lines in the industrial department of a junior high school will be very largely determined by the size of the school and the community in which it is located. It is not practical for a junior high school of a hundred or two hundred students, to attempt to do all the lines of industrial work being done in a school of 1200. The overhead expense would be entirely too great; and the time has come when we must recognize that there is a limit to the amount of money that communities can raise for school purposes, no matter how much they might desire to give unlimited financial support to their public schools. The problem before educators today is to determine the things that a school can do and the amount of money that the community can raise to do this work. Many communities have just about reached their limit.

Another reason why the smaller school should not try to do all the industrial work of the larger school is



PRACTICAL LAUNDRY WORK.

that the needs of the community are different. The out-of-school activities and the interests of the people are not the same as they are in the larger community. In the junior high school, we must endeavor just so far as possible, to give to our boys and girls experiences that are not duplicated in their out-of-school activities.

When a boy enters a junior high school where there is a variety of industrial work, I believe it unwise to ask him to make a selection of the industrial activity in which he desires to engage. If the boy's aptitude is well known to his teachers and he has had sufficient experience to make the selection, there is no serious objection to his doing so no matter what plan may be followed. Personally I feel it is hardly right to ask that a boy make a choice of the shop in which he wishes to work, before he has had any chance to explore the various lines of work offered. While giving him this opportunity for exploration, he is not only exploring the opportunities offered in the school, but he is making very definite observations in the realm of exploring himself as an individual.

At the Jordan junior high school we are, at the present time, offering for boys the following lines of work: woodwork, printing, sheet metal, agriculture, electricity and mechanical drawing. During the first year the boy has an opportunity to work for six weeks in each one of these departments, during which time the instructor observes the boy very carefully. There are reactions as he passes from one line of work to another. The boy himself is observing and registering his own ideas as he passes from one shop to another. At the end of this first year pupils are asked to select three lines in which they wish to work during the second year. As indicated above, in individual cases a boy may select one line rather than three. In such cases the industrial work for that individual boy becomes more and more of the vocational type. Whatever is for the best interests of the boy, that we do, irrespective of any plan we lay down or any "red tape" that may have wound itself around our organization. First, last and always, the boy is to be considered rather than any pre-conceived plans of adults. In this try-out work we include the work on a typewriter. The commercial work of a junior high school is, and I believe ought to be, on a shop basis. It is just as important that a pupil find out early that he does *not* want to operate a typewriter, as it is to find out that he *does* want to operate such a machine.

In the third year of junior high school, or the ninth grade, pupils may select one of the following three courses: academic, industrial, commercial. If they select an industrial course, as a great many of them do, they may then select the shop in which they wish to spend all the time given to industrial work during this year. One third of the time is spent in the mechanical drawing department. This time may be either the first, second, or third twelve weeks of the year. The work of the department is made to correlate closely with the shop in which the boys spend the other 24 weeks of the year. In the ninth grade also a boy may select mechanical drawing as his major. This will give him 24 weeks in the mechanical drawing department and twelve weeks in any one of our shops that he may desire. In other words, during the last year of the junior high school, if a boy majors in a shop he is required to take twelve weeks of mechanical drawing. If he majors in mechanical drawing he is required to take twelve weeks in a shop.

During the first two years everyone is required to take some form of industrial work. The type of industrial work in the second year is very largely optional while in the third or last year it is entirely optional. During the first two years about one-fourth of the day is devoted to industrial activities. This includes applied art, which is given eighty minutes a week. The art work in the Jordan junior high school is based entirely on design and applied to the school and out-of-

TABLE MANNERS ACQUIRED BY PRACTICE.

school activities of the boys. The art department is functioning in the lives of these boys in a way that art has seldom done. We believe in having a man in charge of this particular line of work.

The line of work that we give in our shops at the present time is very largely the result of experiments and experience. We believe that the work should be outlined entirely on a unit basis, arranged in such a way that a boy understands the goal for which he is aiming in each unit of work, at the time he begins that unit. In other words, we believe in an objective being not only in the mind of the teacher but in the mind of the pupil as well. While appreciating the oneness of each unit, we also appreciate the fact that the work of any unit is a factor in accomplishing the work of the following units. This is true whether a boy is working in the wood, sheet metal, printing, agriculture, electrical or mechanical drawing departments.

One of the best courses that we offer at the present time is a short course in home mechanics. One object of this is to connect the home with the school. In fact, in all of our work, we encourage pupils to do the thing that is going to be of some value, not only to the boy as an individual but will also contribute to the life and the unity of the home. We encourage him to bring from home things that may need repairing. There is no reason, for instance, if a boiler needs repairing why the boy of the home should not bring that to school and be taught how to make the repairs. If a chair needs a new rocker, we encourage the boy to bring the chair to school, make the rocker, re-finish the chair, and take it home fit for use. In the home mechanics work we give such units as the following:

Work on windows. In this we take up the matter of fitting windows, how to prevent rattling, the removal of a sash, fixing the weight ropes, care of catches and pulleys, etc.

Locks. Another unit is locks. Here we teach the different kinds of locks, how to put them on, how to reverse, how to locate trouble and how to repair same, and the remedies for locks not remaining latched.

Glazing. We take up the question, in another unit, of glazing in which we give actual work in the cutting and fitting of glass, preparing of the sash before the glass is fitted, etc. At this time we show the boy something of how glass is manufactured.

Wall Papering. Another unit we give in the home mechanics course is papering, at which time we give them actual work in figuring the cost of paper, how to remove old paper, how to clean and repair wall paper.

Electric Repairs. Another unit is the repairing of electric door bells, replenishing batteries, how to locate the cause of blown fuses, how to replace the fuse and what is the general purpose of fuses.

Another short unit is that of *plumbing*, care of water pipes, repair of faucets, etc.

These are only a few of the units given in this home mechanics course but I think they are sufficient to show that this course is of practical value. At the present we give this to boys only. We shall in time give a similar course for girls. There are some things regarding the question of plumbing and electric wiring, that the girl in the home should know just as well as the boy in the home. There are many things that the girl ought to know so as to save expense or to prevent disaster, until an expert can arrive on the scene to repair damages frequently caused around the home through lack of knowledge.

MAKING A CHRISTMAS TREE FOR THE BIRDS.

Throughout all of the industrial work we emphasize the reading of blue prints and the following of charted directions in the various units of work offered. Free-hand sketching is also an important part of our work, or as we sometimes put it up to the boys, "talking with the pencil." This leads directly to the laying out of patterns.

In all of the shopwork, pupils are taught to keep accurate account of material used and the cost of it, time spent on the job and to make an estimate of the value of that time. We sometimes get the cost of the entire job from the commercial standpoint and from this estimate the practical value of the pupil's time.

In all of the industrial work of the junior high school we are not so much concerned with the object to be made as we are with the pupil to be taught. The needs of the pupil and his desires must be the guide in determining what each individual should make as he passes through our various shops. Industrial work, to be rightly handled, cannot follow a cut-and-dried course of study based on the old idea of making a series of models or even making a series of practical, usable, articles.

A question that nearly always arises in the discussion of industrial work of any type of school is, "Should the shops be on strictly a commercial basis?" From a standpoint of organization, all of the industrial activities of either girls or boys should be organized as nearly as conditions will allow on a practical shop basis. By this I mean that the movement from one point in the shop to the other should be so planned that there will be the least amount of time wasted and the fewest number of steps taken. I also mean that a part of the work

at least should be organized so that one boy or a group of boys will do one operation a number of times, passing the product along to another group who will do another operation, sending it on through different groups until it is completed. This organization of work is desirable to give the boy an elementary insight into actual shop practices.

I see no reason why the shops of our junior high schools should be expected to pay for themselves commercially any more than the arithmetic classes or the history classes. I do believe that the material in the article that a boy may make, which he takes into his home, should be paid for by the pupil. This material should be given to him at cost. As an illustration of this, we have a group of boys making cedar chests. The material for these chests costs $15 or $16. When completed they will have a commercial value of from $50 to $60. The boys pay for the material and take the chests home with them. The same thing is true in nearly every one of our shops. The material for beginning work in any shop, however, when it is used for the purpose of demonstration, should be paid for by the school authorities.

While I am not writing at this time particularly of our girls' activities, I do wish to say that our sewing and cooking departments are more or less self-supporting. This is absolutely true with regard to our cooking department. Here the only expense paid for by the school authorities is the salaries of the teachers. Material used is paid for from the proceeds of the lunch room. The demonstration kitchens and the lunch room are considered as one unit and under the same management. The lunch room affords an outlet for the products made in the demonstration kitchens. This plan has been a success with us for over three years and we would not return to the old methods of handling demonstration kitchens and lunch rooms under any circumstances. In the sewing department the girls are more and more bringing from home the material to be used. This is as it should be.

In the junior high school industrial work, where the idea is strictly prevocational, the shop teacher must constantly give information regarding materials used. This will naturally bring in a great many details of interesting allied information. As a boy passes through our shops we expect him to get an idea as to the goal to which this particular activity may lead him. That is, we want him to get an idea of the allied industries of which his shop activity may be considered the foundation. In this way we impart to the boy a great deal of vocational information.

Much might be said regarding records kept of a boy's work as he is going through our industrial department. Each department has records peculiar to its own work. For instance, the printing department has certain records that are not necessary to keep in any other department. We do, however, have a general industrial record card that shows a boy's work as he passes from shop to shop through the three years of our junior high school. This general card shows not only the shop the boy is working in at the present time or in which he has worked, but indicates exactly the work he has accomplished in each of the industrial centers. It also shows the home credits he may have received in any one of the shops. It shows the instructor's comment and the boy's comment regarding the work, and any comment that seems to be necessary regarding the boy's physical condition. It also shows whether or not the instructor gave any vocational advice. It is interesting to follow these records and to compare them as a boy passes from one shop experience to another. The principal can get a good idea of the boy and his reactions by studying carefully his industrial record card. It is not infrequent, at all, to find that one instructor's comment does not in any way agree with that of another instructor, with whom the boy may have worked previously. This card gives a splendid basis for interviews with the boy regarding his likes and dislikes, and his future ambitions.

There has been a great deal of controversy over the question of whether or not teachers of industrial subjects should have teaching experience without having had the actual trade experience, or whether it would not probably be better to take a person with trade experience and no teaching experience or preparation. It appears to me that neither of these extremes is advisable. We want men in the shops of the junior high school who are academically as well prepared as any teacher in the academic department. I think this is necessary if for no other reason than for the influence upon the boy as he thinks of himself in relation with what we call industry or trade. We want him to realize that a foundation knowledge of the integrating subjects of education is absolutely essential. Just as we expect a teacher of history to specialize in history over and above the general academic preparation, so we expect the teacher in the shops to specialize in his particular line of work. This special preparation means not merely a supplementary knowledge gained through a short course in some training school, but it means actual trade experience. Some one may say that it is impossible to have this combination. True, it is rather hard to obtain. This has been especially true during the past few years. It is not going to be so difficult from now on, provided boards of education not only keep the salaries where they are at the present time but further advance them, notwithstanding the cost of living may be going down somewhat. If our schools are going to succeed, we must pay men and women, not only in the industrial department but in all departments, the salaries that will get the type of persons we need and then keep them. We ought not to be content to accept a substitute for the genuine article in teaching any more than we would in our food stuffs. America must realize that its children

deserve, and must have the best, from the standpoint of school opportunities.

When I say men can be secured in industrial departments that will meet all requirements listed above, I am writing with experience. In our own school there is not a man in the industrial department who does not qualify academically and who has not had the trade experience that we so much desire. It may be added also that the men who are teaching in the academic department are, some of them, able to go into the industrial department, should the occasion demand. This brings about a very close correlation. And it is true that each week brings about closer correlation between the industrial activities of our school and academic work.

Much has been said and written regarding vocational guidance. Personally I do not like the term, vocational guidance. I would rather use the term, educational guidance. As stated above each teacher of each subject should consider himself or herself an educational guide and therefor a vocational guide. However, it seems advisable to give a definite amount of vocational information during the three years of the junior high school work. This ought not to be done in a haphazard way. Some of it can be, and is done, through the English department. This should be continued. Some is also done in the various shops in connection with the regular work of the shop. This also should be continued. Over and above this however, we make a definite study of type occupations. This means not only trade occupations but professional as well. We spend at least one, and in some cases two 40-minute periods a week with all of the boys taking them in small groups at which time we present to them certain occupations

NAME_____

STUDENT'S TIME CARD

PRINTING DEPARTMENT — BREMER JUNIOR HIGH SHOOL

CASE NO._____

RACK NO._____ TERM: FROM_____ TO_____

NO OF EXERCISE	DATE BEGUN	DATE FINISHED	TIME IN PERIODS	PROCESSES (TO BE FILLED IN BY THE INSTRUCTOR)

TIME CARD FOR PRINTING CLASS.

Name..... Industrial Record Card

Bremer Junior High School

SHOP	SHEET METAL	WOOD WORK	PRINTING	ELECTRICITY	AGRICULTURE	MECH. DR.	INDUS. ART	
Date								
Instructor								
Mark								
Remarks								
WEEK	Processes	Processes	Processes	Processes	Principles	Principles	Principles	
I								
II								
III								
IV								
V								
VI								
Home Credit								
" "								
" "								
" "								
Instructor's Comment:								
Pupil's Comment:								
Physical Comment:								
Vocational Advice:								

Second Year

SHOP	Date	Instructor	Mark	Remarks	WEEK	Processes	Processes	Processes	Processes	Home Credit	" "	" "	" "	Instructor's Comment:	Pupil's Comment:	Physical Comment:	Vocational Advice:
					I												
					II												
					III												
					IV												
					V												
					VI												
					VII												
					VIII												
					IX												
					X												
					XI												
					XII												
					Home Credit												
					" "												
					" "												
					Comment:												
					Pupil's Comment:												
					Physical Comment:												
					Vocational Advice:												

Third Year

Shop	Shop	Shop
Date	Instructor	Mark
Processes	Processes	Processes
Home Credit	Home Credit	Home Credit
Instructor's Comment:		
Pupil's Comment:		
Vocational Advice:		

FRONT AND BACK OF STUDENT'S INDUSTRIAL RECORD.

JOB TICKET Attach Copy, all Proofs, Two Samples and full report of each workman's time.

No. Date

For

Stock

Cover Stock

Ink Tabs of

Books of

Wanted Punch Numbered

Show Proof Perforate

Remarks

Cost of Stock

Record of Cost	Workmen	No. Hours		
Composition				
"				
"				
"				
"				
.. "				
Cutting Stock				
Makeup				
"				
Press Work				
"				
"				
"				
"				
"				
Folding				
"				
Gathering				
"				
Stitching				
Punching				
Perforating				
Trimming				
Blocking				
TOTAL CHARGES				

Date Delivered Delivered to

JOB TICKET FOR PRINTING CLASS.

for their consideration. We want them to know the physical conditions necessary to carry on various lines of work, the working hours, the education necessary, etc.

Before starting on a definite study of type occupations indicated above, we ask the boy to think of himself in relation to some line of work that he has already, in his own mind, selected for himself. Boys of junior high school age are beginning to think of themselves in terms of economic producers. They do not use this high sounding term, however, and they are not conscious of it. *Boys are thinking.* It is necessary not only that they should think but we want them to think with a definite object or goal in view. We ask them to select any occupation they think they would like to enter when they have to take care of themselves financially. Then we ask them to analyze this job and analyze themselves in relation to it. This is all done under the guidance of instructors. Before he finishes his analysis in practically every case he changes his idea regarding the occupation he has selected. If he does not, it would seem to me all work with him has been of very little value, as it will indicate that he has not gained a clearer insight than previously into the occupation he has selected.

It is impossible to indicate all the points covered in the "self analysis for self guidance." I have indicated just a few. After the boy has made the selection we help him to discover whether or not the occupation thus selected is constant, temporary, permanent, seasonal, skilled, or unskilled. We want him to know the physical and mental requirements necessary and then to size himself up to see whether he can meet these physical and mental requirements. If he cannot meet them, say physically, there is one of two things for him to do. Either he must be willing to put himself in the right physical condition, if that is possible, or he must change his selection. Many failures in this world can be traced to the fact that the physical makeup of the worker is not adapted to the work required. This is true with women as well as with men. We also want the boy to know the time necessary to make preparation to do things that he wishes to do. We then put it up to him to find out whether he is willing to pay this price. If he feels that financially he is not able to do it, then we want to show him how to help himself while he is preparing to enter the field he may have selected. We want him also to consider the working hours, whether it is night or day, or whether it is work that might require "split hours." We want him to be familiar with the income he may expect, the character of his associates, and his service to those associates. It is of great importance that he should consider what opportunities the occupation he has selected offers for advanced study and for promotion. We also discuss with him the legal protection afforded the worker. Some person may say this is going into the work too much in detail. We contend that it is not because we know the value of it. In the first place it connects the boy's school work with the world in which he lives. He will consider more carefully changes he may wish to make. He is less liable to seek "blind alley" jobs.

Following this analysis we get together the boys who indicate a desire to follow the same general line of work. If, for instance, several want to be electrical engineers, we get them together with the instructor in our electrical department who is a practical electrical engineer. He considers in detail with these boys this special line of work. We do the same with boys who would like to be printers or wish to enter any of the allied printing trades. Occasionally we find boys who want to be doctors or dentists. We advise them so far as we can. It is not uncommon at all at the present time to find girls who desire to become nurses. These girls, we place in touch with our school nurse. Much more might be written on this line of vocational advice but enough has been stated to show the general plan.

Let the junior high people, the academic teachers, industrial teachers, and principals consider the work first, last and always from the standpoint of the individual. The junior high school is a democratic institution, and will become to a still larger extent, a greater democratizing factor in our educational system. The industrial department is not a flavor or a sauce but is a vital part of the educational work of the junior high school. It is just as important in itself as is history or geography. It is a means that we use for helping and directing the boy to discover himself. It is a means and not an end in itself. The end of all education is that the individual may become an economic social asset and not a liability.

BLUE PRINTING

J. T. Van Stan, Williamson, Pa.

THERE is an art in making blue prints that can be attained only by experience.

As a rule we speak of blue printing being done on paper, and while this is true it is well to remember that other materials can be and are used in many instances. Chiefly of these other materials is linen, which is often used at present for especial cases, but for general purposes it is too expensive. Any plane surface may be used for blue printing, provided that surface is in good condition and the material will not change chemically the sensitizing solution.

Many grades of paper can be bought on the market, each claiming all the good points essential to good results in blue printing, and most of these papers have been found possessing all the good qualities they claim. Any white paper which possesses a high tensile value and has a semi-gloss finish is a good paper to use. A

high grade of excellent qualities should be used for special purposes since it will of course make a better print but for ordinary purposes its expense makes it impracticable.

The whole process as we picture it these days is largely dependent upon the machinery method. This method, naturally, has supplanted the old or hand process to quite an extent. It is essential, however, that the journeyman and student draftsman be familiar with both processes.

A brief description of sensitizing the paper by the machinery method is as follows: The roll of good quality paper (thin, medium or heavy of some desired width) is placed upon the rack at the front of the coating machine. From the rack it is simply run between two rotating rubber rolls, which stand in a vertical position. the finished side of the paper at all times in contact with the under roll since it is the one which applies the coating solution.

These two rubber rolls being forced tightly against each other by means of a spring device quite similar to that in the usual clothes wringer, insures against the paper slipping and permits it being drawn through evenly.

Just beneath the bottom roll, mentioned as the one which does the applying, a long pan, which contains the coating or sensitizing solution, is placed so as to permit this bottom roll to be always partly submerged in the solution.

Now after noting carefully the foregoing we come to this conclusion, that the chief feature of the machinery method of coating the paper, is simply squeezing or stamping the sensitizing solution on the surface of the paper, and not brushing or sponging.

After the paper passes through the coating rolls it is carried over electric dryers and thence made up into rolls of various quantities.

A coating or sensitizing solution for either the machinery or hand process, and one which has proved its worth from use is made up of the following chemicals:

1. ½ oz. citrate of iron and ammonia plus 2 oz of H_2O.
2. 1½ oz. iron and sodium oxalate plus 6¼ oz. of H_2O.
3. ¼ oz. potassium ferricyanide plus 4 oz. of H_2O.
4. ⅝ oz, oxalic acid (saturated).

It is advisable to use hot water and to dissolve the chemical in the order given. The container for the solution, should be of some opaque material or at least an amber glass vessel and should be kept at all times in a cool, dark place. Before any solution is used, it should be well shaken.

When applying the coating by hand, the sheets may be cut to size either before or after the solution is applied. This coating solution is more satisfactorily applied with a sponge than with a camel's hair brush, since with a sponge, excess solution can readily be removed from the paper, returned to the receptacle and used again.

When applying the coating allow the sponge to absorb the solution to its full capacity, then using the right to left motion, go over the surface of the paper until every particle of space is covered. After the excess solution is removed and the paper has lain in a horizontal position for a minute or so it is hung up by one edge to dry. Then after it is removed it is placed in a dark place, ready for use.

There are various forms of printing frame, but they all resemble that used in photography. The tracing or negative is placed in the frame with the sensitized paper in such a manner as to allow the light to pass through the negative to the coated side of the paper, then all are pressed tightly against the glass. The glass must be kept clean and free from moisture and have an equal bearing all over the tracing or negative.

The time for exposure varies from thirty seconds for a bright mild day, to eight or ten minutes for a very dull cold day. After exposure, the print is washed for five minutes and then hung up to dry. The exposure required when making a print from a Van Dyke negative is twelve minutes for a bright mild day to thirty minutes for a dull cold day.

To restore prints that have been overexposed (except in cases where the damage is too great) simply add enough bichromate of potash to the print wash to make the lines on the print a clear white. It is well to remember that another remedy for restoring an overexposed print is to wash it all over with the original sensitizing solution.

The process of blue printing depends upon two facts: 1. That ferrous salts are changed to ferric salts by light when in the presence of a reducing agent. 2. That potassium ferri-cyanide reacts with ferrous salts forming a deep blue.

In the mixture given, the citrate of iron and ammonia is the ferric salt. In the presence of oxalic acid, the reducing agent, it is changed to ferrous salt, i. e., its valence is changed from three to two. This ferrous salt when in the presence of water, unites with the iron and sodium oxalate and the potassium ferri-cyanide, thus forming the deep blue we get on the surface of the paper. The water also washes away the chemical not affected by the light.

Blue printing is done mostly by a machine invented for the purpose. This machine has a compartment fitted up with artificial light which may be an ordinary arc lamp, mercury tube, or any light which, in practice, is considered white light.

After tracing and blue printing paper have passed the exposing compartment they separate, the tracing passing out of the machine while the print passes to a washing tank. From this tank it is carried through the wringer to the dryer and finally to the trimmers.

A Project In Reed Furniture Weaving

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NO kind of handwork is so adaptable to schools of various sizes as reed and fibre-cord furniture weaving. This is true because of the small expense incurred in equipping a room for the work, the very small amount of space needed, and the slight cost to each student if he is required to purchase his own materials.

The table lamp for which instructions are given in this article is of very beautiful design, very popular, and inexpensive. The cost of reed used in this lamp is approximately two dollars and a half. It stands about 20″ when completed.

The fibre cord may be used in this project instead of reed, as it is equally suitable and has the decided advantage of being used without soaking. Fibre must always be sized with art fibre sizing, stained, and shellaced.

Material Needed.

18′ of ½″ reed.
200′ of winding reed.
75′ of ¼″ flat reed.
40′ of No. 6 reed.
90′ of No. 5 reed.
¼ lb. of No. 3 reed.
¼ pt. of stain.
¼ pt. of shellac.
⅜″ No. 20 steel wire nails (not brads).
¾″ steel wire escutcheon pins for nailing braid.
1¼″ three penny steel wire nails.
Fixture for gas or electricity.

To avoid accidentally cutting the reed, *pruning shears* of *California* Model should be used. These and the *round nose pliers* can be purchased at any hardware. The *nail drivers* are a little on the order of pliers, and can be made by any good blacksmith, as these are not on the market. Some students use common long nose pliers, for a hammer cannot be used.

While making the lamp a close study of figures 1 and 10 will be found very helpful.

LAMP BASE.

I. Frame for the base.

Cut four pieces of ½″ reed 16″ long. These are to be used for the posts. From a piece of pine board ½″ thick cut two pieces 2¾″ square and bore holes, as shown in f (Fig. 3). Soak the 16″ posts until very pliable. Nail the four posts to one of the blocks, being careful to keep block a (Fig. 2) flush with the end of the posts. Eight inches from lower edge of the top block nail the second block b (Fig. 2) to all four posts, using 3 penny nails. Next, ⅜″ from the top block, and ⅜″ from above the bottom block, make a pencil mark on each post. At intervals of one inch mark the space between the two marks just made (Fig. 2).

II. Lattice Work.

Cut eight pieces of No. 6 reed, two for each side, 26″ long, and soak until very pliable. The lattice work is begun by finding the center of the 26″ pieces and crushing each piece with the round nose pliers $\frac{1}{16}$″ each side of the center, thus making it possible to bend the reed at sharp angle. The crushed places of the first strand should be nailed to points 1 and a′, using a $\frac{3}{16}$″ No. 20 wire nail. These nails have to be driven with nail drivers, as a hammer cannot be used in this space. The second strand is then fastened at 2 and a in a like manner. Extreme

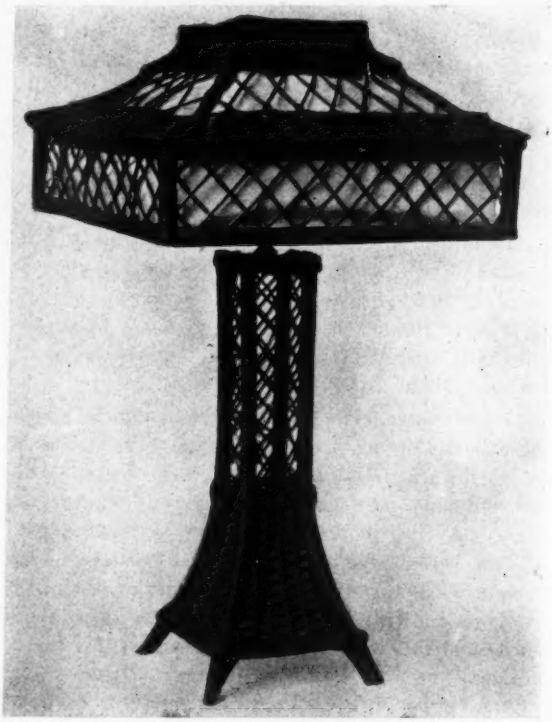


FIG. 1. THE COMPLETED LAMP.

care should be exercised to crush the reed at the exact point that it is to be nailed. For convenience we will call the strand on the left x, and on the right y; the left strand of x, x1, and the right strand xr; the left strand of y, y1, and the right yr.

Bring strand xr from 1 to b, crush and nail.
Bring strand x1 from a to c, crush and nail.
Bring strand y1 from 2 to b′, crush and nail.
Bring strand yr from a to c′, crush and nail.
Bring strand y1 from b′ to d, crush and nail.
Bring strand yr from c′ to e, crush and nail.
Bring strand xr from b to d′, crush and nail.
Bring strand x1 from c to e′, crush and nail.
Bring strand xr from d′ to f, crush and nail.
Bring strand x1 from e′ to g, crush and nail.
Bring strand y1 from d to f′, crush and nail.
Bring strand yr from e to g′, crush and nail.
Bring strand y1 from f′ to h, crush and nail.
Bring strand yr from g′ to 4, crush and nail.
Bring strand xr from f to h′, crush and nail.
Bring strand x1 from g to 3, crush and nail.
Bring strand xr from h′ to 3, crush and nail.
Bring strand y1 from h to 4, crush and nail.

Cut off ends allowing ¼″ for nailing. Proceed with the other three sides in exactly the same manner. Be careful to crush strands accurately so that the points of nailing will be directly opposite, on the two sides of the post. This will prevent curving of the posts, a difficulty which is likely to be encountered by the amateur.

III. Winding the posts.

Cut four pieces of winding reed 7 ft. 6 in. long, and allow to soak. Winding should always be started at the top of posts, proceeding from left to right. Nail a piece of this winding onto the edge of the block at the top. Slide this strand between the thumb and finger to see that it is not twisted. To avoid doing this each time it goes around the post it is well to slip the end through and

catch it between the index and middle fingers, holding it there, using the index finger and thumb to tighten. Allow the winding strand to go over the lattice work strand, where it is nailed to the post, once only, as this covers the nail satisfactorily. Often students fail to get the lattice strands fastened to the post exactly opposite each other and cannot catch it on both sides at the same time. In this case catch one, and the next time around catch the one on the opposite side. Tack the winding strand to the block **b** (Fig. 2) at the bottom, when finished, and proceed with the other posts.

Sometimes it is necessary to splice the winding material. This should always be done on the inside, where it cannot be seen. Place the new piece of the winding reed on the post and parallel to it, with the round side toward the post (Fig. 5) **b**. Continue winding with the old strand for about an inch, then catch both strands and twist them over. This brings the new piece on top, oval side out, with the old strand underneath, flat side out. Continue the winding with the new strand, thereby winding both ends underneath the winder (Fig. 5).

Table Lamp.

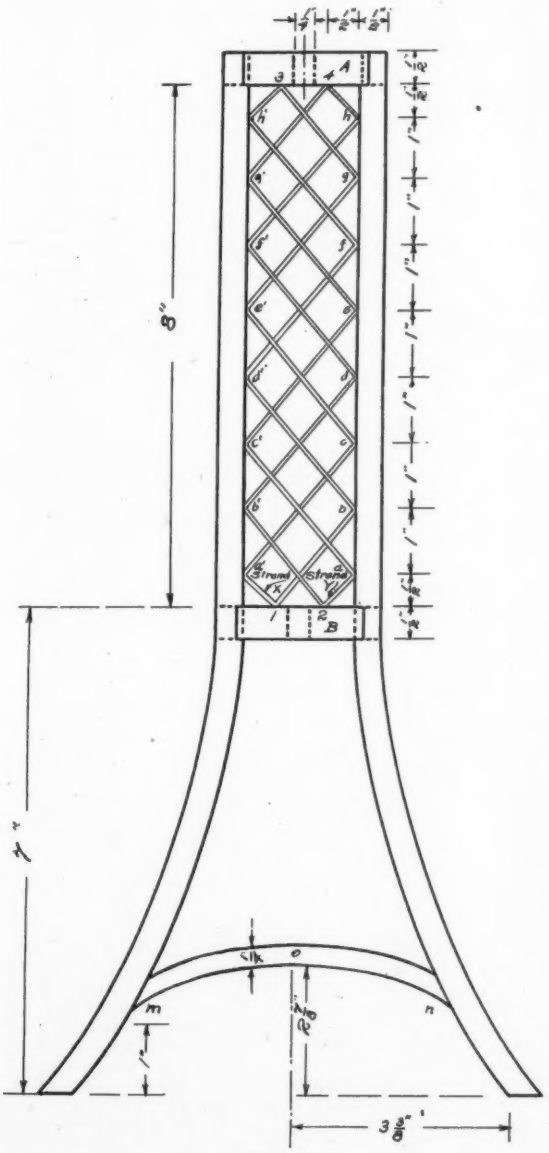


FIG. 2.

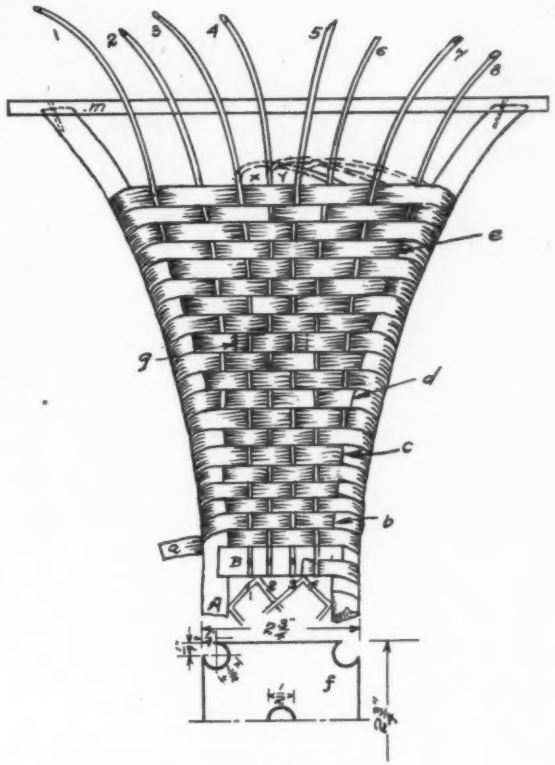


FIG. 3.

IV. Spreading the base.

Soak the posts up to block **b** until perfectly pliable. Obtain a thin board ½″x8½″x8½″. Bore four holes 7¼″ apart from center to center ¼″ deep. Spread posts and insert in these holes, and nail securely from the bottom. While still wet the curve may be shaped. This board is merely a temporary base, **m** (Fig. 3). For braces cut four pieces of ¼″ reed 8″ long and taper the ends, as shown in Fig. 2, **m** and **n**. Soak braces and nail to the four posts, one inch from end of posts, using ½″ No. 20 wire nails. The curve these braces take is not of great importance as it is covered by the weaving.

V. Weaving the bottom part of base.

Cut ten pieces of No. 5 reed 10″ long. On three sides of block **b** (Fig. 3) nail three of these stakes, each equally spaced. On the fourth side nail four stakes, making 13 in all. **An odd number of stakes is always necessary where a single weaver is to be used.** Turn the top of the pedestal part of the lamp toward you. Place the end of a ¼″ strand of flat reed behind the post **A**, at the left. Weave over stake 1, under stake 2, over stake 3, until once around, including the corner posts as stakes. The second time around the weaver will come under the corner posts at **b** (Fig. 3). Then it is necessary to wind the weaver once around these posts. This will occur every other time around. After weaving five times around, cut eight pieces of No. 5 reed 8″ long, taper the ends, and nail to the sides of the posts at **c** (Fig. 3), being careful to get them exactly opposite each other, nailing with ⅜″ No. 20 wire nails. Weave around twice, as before, ignoring the new stakes in the count. The third time around include the new stakes. Continue the over and under weave until you have woven around about 19 times from the top. Then cut eight more stakes 6″ long, fasten as above, and weave down as far as it is possible to get the weaver between the place where the brace and the posts are nailed.

VI. Finishing the base.

Now crush each stake as close to the lower edge of the weaver as possible. With the top of the pedestal toward you start with the third stake from the corner post **A** (Fig. 3), on the left. Bring this stake, No. 3,

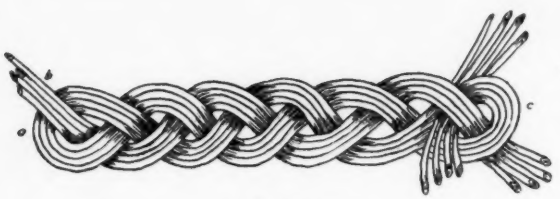


FIG. 4.

to the right, on the outside, and in front of stake No. 4 and 5 to the inside of the base, allowing it to remain back of No. 6. Then carry No. 4 in front of five and 6 and back of 7. Continue this weave until around the base to the last stake on the fourth side, ignoring the corner posts. Bring this stake in front of 1 and 2 and back of 3. Next bring No. 1 in front of 2 and 3 and back of 4 in the opening x, then bring 2 in front of 3 and 4 and

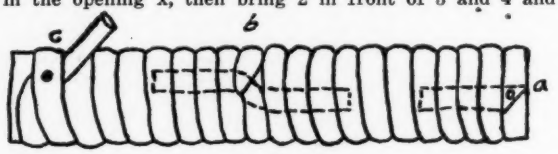


FIG. 5.

back of 5 in the opening y. This completes locking the ends of all the stakes and leaves all the ends inside of the base. Thin these ends with a pair of pruning shears being careful not to cut them short enough that they will slip from behind the stakes, to the outside of the base.

VII. Winding the feet.

Cut four pieces of winding material and fold at right angles (Fig. 5) **a**, allowing the end to be wound underneath. Begin at the bottom. Drive a nail into the fold to hold it securely. Wind up as far as possible under the finish just woven, fastening with a nail, **c** (Fig. 5). Proceed with the other three posts in like manner.

VIII. Making the braid.

The braid may be woven with any number of strands. In Fig. 4 four strands are shown, but for the base of the lamp only three strands are used. Cut three pieces of No. 3 reed 36″ long and three pieces 72″ long. Bend the 72″ pieces in the center as shown in (Fig. 4) at **a**. Slip the 36″ pieces (Fig. 4, **b**) over the bend, and braid as shown. After the braid is sufficiently long to go around and overlap about one inch, it is locked by bringing the three strands at the left around and under the strands they just went over. The ends may now be cut off so they do not project beyond the braid. This braid is nailed to place with ¾″ steel escutcheon pins, nailing end **c** first.

LAMP SHADE.

The shade for which the following instructions are given is woven with an open top so that lamp may be equipped either with gas or electric fixture.

Cut four pieces of ½″ reed 5¾″ long. Miter these pieces at an angle of 45°. Glue the ends and nail together with a double pointed tack as shown at **m** (Fig. 6), and allow to dry.

Where the lamp is to be used for electricity a piece of soft wood ½″x5¾″x5¾″ can be used instead of the frame, as no opening is needed. This will simplify the construction.

I. Frame for shade.

Cut 8 pieces of ½″ reed 13″ long and 4 pieces 2⅜″ long. Measure one-half inch from the end of each of the 13″ pieces and saw through ½ the diameter of these pieces, being careful to cut them on the same side at both ends. With knife cut the pieces out as shown at **n** (Fig. 6). Glue and nail these 13″ pieces together. When nailing drive a 1¼″ three penny nail through both pieces and into the end of one of the 2⅜″ pieces. Do this with all four corners. Then make a second 13″ frame, nailing to the same 2⅜″ pieces, at the bottom. This completes the frame for the lattice. Next cut 4 pieces 7¾″ long for K (Fig. 6). Bore a ¼″ hole in each corner of the frame L (Fig. 6) at such an angle that the corner pieces K have the desired downward slope. Glue and insert K. Three-eighth inch No. 20 nails can also be driven through the

Lamp Shade.

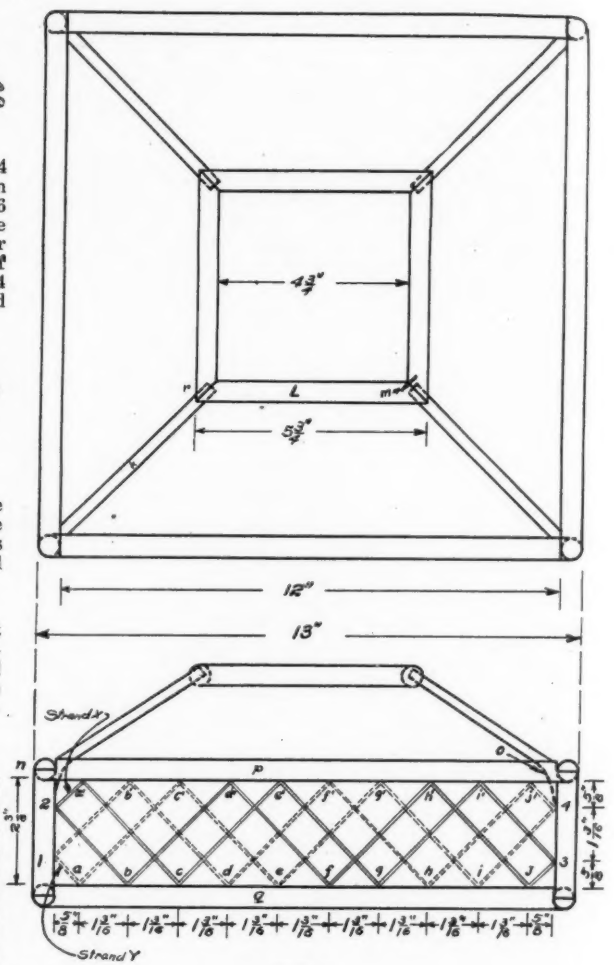


FIG. 6.

frame into K. Seven inches from frame L, crush K and taper from this point and nail to inside of lattice work frame, at **O**.

II. Holding frame in shape.

Before beginning the lattice work secure a piece of soft wood ⅛″x3⅛″x12″. With ½″ No. 20 wire nails nail this piece to the inside of rod **p** (Fig. 6); pull this rod straight before the nails are driven, then rod **q** can be nailed to other edge of same board. It is well to cut a piece of reed 2⅜″ long and use it as a gauge between **p** and **q** after **p** has been nailed. When the lattice work has been placed in this side, remove the brace and nail to the next side.

III. Lattice.

Cut 8 pieces, two for each side, of No. 6 reed 36″ long, for the lattice. Find the center of these pieces and ⅜″ each side of the center crush with the round nose pliers. Call upper strand **x** and lower strand **y** (Fig. 6) and the right end of each **r** and the left end 1. Letter the rods **p** and **q** as in figure 6. Nail upper strand at 2 and a and bring strand xr from 2 to b, crush and nail, bring strand x1 from a′ to c, crush and nail, bring strand xr from b to d′, crush and nail, bring strand x1 from c to e′ crush and nail, bring strand xr from d′ to f, crush and nail, bring strand x1 from e′ to g, crush and nail, bring strand xr from f to h′ crush and nail, bring strand x1 from g to i′, crush and nail, bring strand xr from h′ to

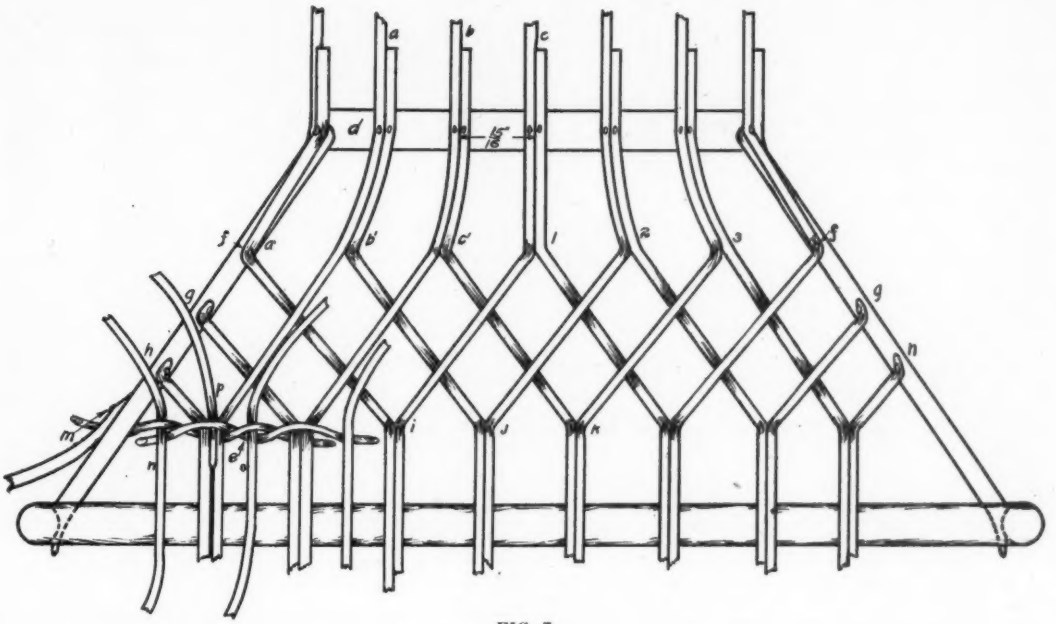


FIG. 7.

j, crush and nail, bring strand, x1 from i′ to 3, crush and nail, bring strand xr from j to 3, crush and nail.

This final nailing can be done neatly if the end of the strands are crushed at 3, then tapered, making a neat splice, laid together, and one nail driven through both strands, holding them securely.

Crush strand **y** as strand **x** was crushed and nail at 1 and **a**.

Bring stand Y1 from 1 to b′, crush and nail.
Bring strand yr from a to c′, crush and nail.
Bring strand y1 from b′ to d, crush and nail.
Bring strand yr from c′ to e, crush and nail.
Bring strand yl from d to f′, crush and nail.
Bring strand yr from e to g′ crush and nail.
Bring strand y1 from f′ to h, crush and nail.
Bring strand yr from g′ to i, crush and nail.
Bring strand y1 from h to j′, crush and nail.
Bring strand yr from i to 4, crush and nail.
Brind strand y1 from j′ to 4, crush and nail.
The other three sides are done in the same way.

IV. Winding.

About 130 feet of winding reed is required for the shade. Follow directions given for winding the posts in the base. When found necessary to splice this winding do it as previously explained, and shown in **b** (Fig. 5). The corners must be covered first, a process called strapping, used often in reed furniture construction. Cut 4 pieces of winding reed 3″ long. Nail these pieces at **a** and **b** (Fig. 8). These ends at **a** and **b** are then wound under, and thus the winding on the upright rods appears to continue to the bottom.

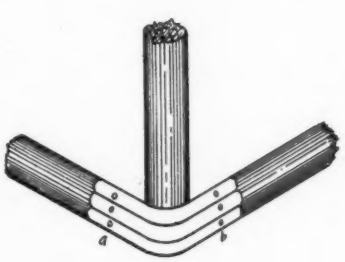


FIG. 8.

V. Nailing stakes for weaving top.

Cut 48 pieces of No. 5 reed 15″ long. Crush 5″ from the end and nail stakes, where crushed, in pairs, to rod **d** (Fig. 7). Divide rod **d** into six equal spaces. Nail one pair of stakes on each corner so that the strands may be used on adjacent sides of the shade. Nail other five pairs to **d** at points marked.

VI. Pairing weave.

Taking two weavers of No. 3 reed, place one behind stake **a** (Fig. 7) and the other behind stake **b**, above **d**. The weaver to the left, in this case the one under **a**, each time is brought to the outside of the shade, over one stake and back of one, crossing on top of the other weaver at the right, as shown at **e** (Fig. 7). Continue this weave five times around the top, being careful that all stakes are vertical. It may be necessary to splice the weaver. To do this the old weaver is allowed to end behind any stake and the new is inserted behind the same stake. After the fifth time around cut the stake at the right of each, pair off even with the weaving **a**, **b**, **c** (Fig. 7), with the pruning shears. Crush the stake that remains, as close to the weaver as possible and finish off as the base was finished, (Fig. 3), in front of two and back of one. Beginning below the nails, or **d**, weave eight times around the lamp using the pairing weave and then crush all the stakes close to the weaver.

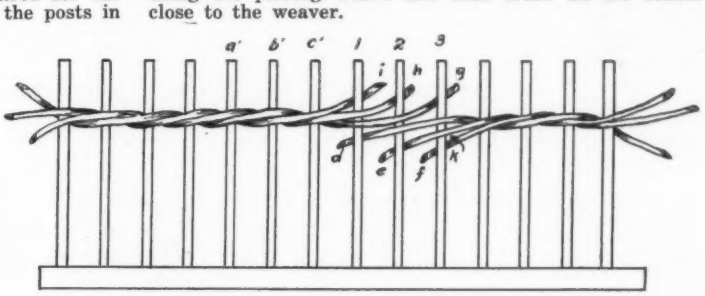


FIG. 9.

VII. Three Rod Coil.

Now we are ready for the three rod coil which is woven tightly against the weaving just completed. Figure 9 shows this in detail. Cut three pieces of No. 5 reed 7″ longer than the distance around the shade, just even with the weaver. Place these three weavers back of three consecutive stakes as shown at 1, 2, 3 (Fig. 9), allowing them to project 2″ on the inside of the shade. Beginning with the weaver to the left, each weaver is brought successively in front of two stakes and back of one, crossing on top of the two weavers to the right. Continue this weave to the initial stake 1 (Fig. 9).

VIII. Reversing the Coil.

For convenience we will number the stakes to the left of the initial stake **a, b, c** (Fig. 9), and the two to the right **1, 2, 3.** At this point the coil is to be reversed. Carry the weaver farthest to the right (the one passing back of **c**, figure 9), in front of **1** and **2** and back of **3.** The weaver back of spoke **b** passes in front of **c** and **1** and back of **2,** and the weaver at **a** passes in front of **b** and **c** and back of the initial stake **1.** If this is completed properly the left hand weaver will finish behind the initial stake.

IX. Locking a Coil.

Behind spokes 1, 2, 3 (Fig. 9), a weaver begins, and one ends. Hold the weaver **f,** back of stake 3, inward or away from stake. Draw weaver **g** back of stake 3 and under the coil to outside between 3 and 4 at **k.** Hold weaver **e** back of stake 2, inward and away from the stake and bring weaver **h** behind the same stake, under the coil to the outside as before. Hold the beginning weaver **d** behind stake 1 inward as above and bring weaver **i** to the outside underneath the coil, thus locking it. Trim the ends on the outside and inside with a long sloping cut thus permitting them to lie close together.

X. Lattice Work.

Push the coil up very tightly so that when it is released it will cover crushed places. The stakes can then be separated permitting them to remain tightly together, above the coil. Crush and nail the strands on the corners at **f** (Fig. 7). Cut 8 pieces of No. 5 reed 10″ long. Nail one reed at point **g** on **K** one inch below **f** and one reed on adjacent side of **K** at same point. Nail reeds in same manner at point **h** one inch below **g.** Cut four strands No. 5 reed 6″ long. Nail at **m,** ½″ below **h** at all four corners.

Separate strands at coil, allowing all strands coming from left to right to cross on top of strands coming from right to left. It is advisable for the amateur to tie these strands at **i, j, k,** etc., before crushing. This enables him to adjust lattice so that pairing weave **e** will run in a straight line. Then crush where tied, allowing stake to run parallel as shown in Fig. 7. We now have two rows of meshes as shown in Fig. 7.

XI. Putting in New Stakes and Finishing.

Cut 36 stakes 8″ long No. 5 reed. These stakes, as **m** and **c,** are woven in as shown at **e.** with equal lengths above and below the first weaving. The pairing weave is used, to the outer edge of the frame. The only difficulty likely to be encountered is at the corners. Ignore corner rod **K** (Fig. 6), weaving around stake **m** instead.

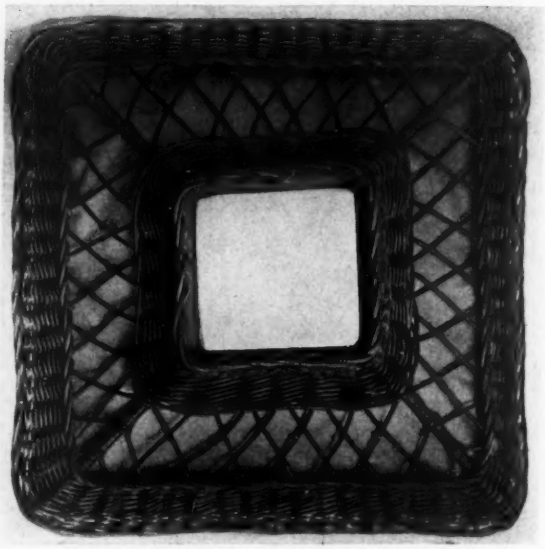


FIG. 10. TOP OF LAMP SHADE.

Cut 36 pieces, No. 5 reed, 4″ long and insert between the lattice strands, as shown at **p,** and beside the single strand on the corner **m** (Fig. 7). Be careful to force reeds down securely. Finish off the shade by bringing each of these stakes in front of two and back of third stake, all the way around, just as in the base, ignoring the corner rods, **K.** There remain the stakes projecting to the outside of the shade. Cut off the right stake of each pair close to the weaver, and crush the one remaining and finish off as above. Braid a two strand braid and nail on the shade to cover the nail heads on rod **d.** Wind rod **K** where exposed. After staining, shellacing and lining shade, the lamp is complete.

Block Printing For A High School Year Book

Rachel Skinner, Madison, Wis.

THE great expense of getting out a High School Annual nowadays is a grave question for most schools to solve. Materials are exceedingly high, and printing is enormously expensive. Because of insufficient funds, the average high school cannot afford more than three or four cuts in its year book, and these cuts are printed usually in only one color, the price of attractive, multi-colored plates being prohibitive.

For the past two years in the Champaign High School we tried the experiment of making and printing our own cuts. We had a Poco Proof Press, manufactured by Horace Hacker & Company, of Chicago, on which we printed all of the cuts which went into the year book. The process was exceedingly simple; the press was run by hand. When designs were selected, they were made backward, transferred to linoleum blocks mounted type high, and carefully cut and carved out. The subjects were simple, of course, with a minimum of detail or line drawing. Mass designs worked out ideally; since such work is coming into vogue more and more, I found another argument in favor of our experiment. We might have as many colors as we wished in our prints, though for each one we were obliged necessarily to cut a separate wood-block.

Last year my drawing classes worked on designs of every description. A list of subjects and suggestions was posted; this list grew as the work and the book progressed and gave pupils not in direct touch with the year book some idea of what was needed. I set a month as the time limit for our design contest, and at the end of that time submitted the results to two experienced instructors who chose the drawings best suited for the book. The contest idea worked well, as it always does; the honor of producing plates for the annual was sufficient stimulus to keep the entire class alert and vitally interested.

One member of the Senior Class had already been chosen art editor. When the blocks were selected and cut, it was his business to print them and to arrange them properly in the copies of the books, which were then ready to be bound. He could select as many assist-

DESIGNS ORIGINATED AND CUT BY THE AUTHOR'S CLASS.

ants as he chose, but the responsilibity was his.

Besides the financial importance of this experiment, there was opportunity in it for productive teaching of the most effective kind. There was splendid possibility for individual assignment and growth; the subject matter was flexible and each pupil could suit his tastes; the work was practical and therefore attractive. Combined with informal talks on printing, occasional visits to printing or engraving establishments, it could become effective perhaps in prevocational guidance.

INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN
Editors

EDITORIAL

WORK EXPOSES INTEREST AND NEED.

It has been evident in the school art exhibits of the past year that the practice of freehand drawing as a process of art study in the schools, is essential and is maintained. This in spite of the assertion by some in authority who have insisted that pictorial art and the execution of it, are the concern of the professional artist only.

The trite and almost traditional assertion that "drawing is the common language through which art is expressed" has not yet been refuted, though it has been often denied by theorists in art education.

After several years of emphasis on the necessity of applied design and the complete execution of school projects in substantial material, the school exhibits are still in large proportion on paper and of paper. We consider this inevitable if not desirable. No school course in art can dispense with thorough training in graphical expression. No adequate school course in art can confine itself to the execution of the few projects that can be executed in substantial material during the limited time and under the limited facilities of the common school. As in written language, each project demands adjustment peculiar to the message and conditions under which the message is conveyed. This adjustment is design, whether applied to a sermon, a verse, a dress, or a chair, but it requires the vocabulary and synthesis of grammar and syntax, of drawing and composition.

During recent years we have noted a very great interest in announcements directed to advertise and pronounce ideas. Such work has been given the general name of Commercial Art. A large part of our school art has been directed to this interest. It has involved lettering and drawing in great variety. It has emphasized the desirable selection of tones, shapes, values, and colors that belong to both drawing and design. It has aroused the interest of thousands of pupils in graphical expression, who would have rebelled against formal lessons in drawing and lettering as presented a few years ago. It has, when properly directed, been the means of developing conceptions of fine art, and may be the means of developing future generations to the conception and execution of works of fine art.

This condition of interest should be significant to the art teacher. The art teacher must learn to draw freely, accurately, and effectively. The art teacher who cannot draw expressively is comparable to a tongue-tied teacher of English.

RESOLUTIONS.

The season of new resolutions for the teacher comes with the opening of school. With the past year in retrospect and a new year in immediate prospect, with revived energy and the courage that goes with it, we can be optimistic in our plans, and look forward to some decisive methods for improvement.

With the same equipment and environment of last year, we have a different group of children to deal with. When we recall how the children of last year appeared as so many peas in a pod on the first day of school, and how, after a few weeks of acquaintance, they proved to be individual in response and ability, the responsibility of the teacher comes to us with great force. Perhaps at the beginning of last year we conceived that a carefully planned course of work carried out to the letter and on schedule represented the greatest pedagogical accomplishment.

Now we know that a teacher who is not the interpreter of a course of study and the patient, inspirational friend of each and every child in the school, is far below standard. Now we know that the usual tabulated qualifications of a teacher's personality and preparation may mean much or little. The teacher should as a matter of course be neat, polite, pleasant of speech and manner, have executive ability, and know the subject matter of the courses taught, but if the teacher is not willing and able to help a variety of individuals develop their individual abilities, the work of this year will be a routine performance for pupils and teachers alike.

This is a type of teacher from which the schools might well be relieved. He belongs in the systematic, organized business office. He is a clog to the process of education, but may become a cog in the wheel of industry. He reduces his school work to a routine performance that carries off the program, regardless of the product and the product is human.

WHY NOT MAKE AN APPLICATION EFFECTIVE?

It is perfectly astounding how much time is uselessly consumed in the matter of applications and the attempts to shift from one position to another. A very large amount of this waste is due to the fragmentary, incomplete character of the information furnished by the applicant.

The seeker of a position should assume that his prospective employer is eager to know *all* about him. Sometimes, apparently, minor details decide a case in one's favor. Other times, the absence of certain minor details reverses the decision.

Anything that raises a doubt in an employer's mind is against the candidate. It is safer to make a frank statement of damaging evidence than it is to risk the surmises of an employer concerning doubtful points and evaded facts.

Many a position has been lost by the failure to furnish a photograph. The prospective employer prefers to know the worst rather than to risk the possibilities of the unknown factor. Other multitudes of applicants

have been disappointed by poor writing, careless composition, and misspelling.

Furthermore, an applicant need have little fear of tiring his prospective employer by a detailed statement of his training, experience, etc., if only he keep to the simple statement of facts, purposes, and ambitions. These are what the employer wants. If one can only state his qualifications fully, frankly, and sincerely, he will win a confidence and respect that will outweigh any petty defects or doubts which a frank statement may reveal.

The first communication of an applicant, therefore, should present complete information concerning his training, experience, health, family, church affiliations, purposes, ambitions, reasons for changing, etc., accompanied by a photograph, so that the prospective employer will not find it necessary to conduct a lengthy correspondence before arranging an interview. The first letter should secure an interview, if the applicant presents anything like adequate preparation and training for the position in question.

If these suggestions were followed, there would be far fewer disappointments and a remarkable saving of time.

THE TEACHER SHORTAGE.

Sometime ago the cry went out from pulpit, platform, and press that the teacher shortage was endangering the schools and the whole educational scheme. It was not just a scare. It was a real situation that threatened serious consequences. Attractions outside of the teaching profession were so alluring that many teachers yielded to the temptation. The amount of money received was larger at the first of the month and smaller at the last, but it was fascinating to see it passing through on its way.

Things have changed. Teachers are coming back in great numbers. Many of them are saying "It was wonderful while it lasted, but never again!" Some have found the expense of getting out and back again left them no better off financially. Sometimes they have found it necessary to go back to the schools with but little improvement, if any, in their positions.

All these changes and shifts and unsettled conditions have really had a most beneficial effect. Teachers needed the contact with things outside the schoolroom. They needed the broader vision which the commercial and industrial world furnished. They needed also to see a little more of the sordidness of things as contrasted with some of the idealism of the teacher, in order fully to appreciate the fineness and usefulness of the good, conscientious teacher.

Meanwhile, the teachers who stood by during the stress and storm have something to be proud of; and they have had recognitions and compensations both in genuine appreciation of their fellowmen and in increased renumeration.

There is still a shortage of skillful teachers. We suppose the supply will never be adequate and the skill will never be nearly enough perfection; but improvements are being made on every hand and the future looks somewhat brighter than for the past several years.

THE BACKWARD STEP IN ILLINOIS.

Under the prompting of reactionary influences, Illinois has done the expected thing in education, as usual. Indeed we have begun to expect the unexpected of Illinois, especially if the unexpected happens to be a reactionary, backward step.

Illinois has ham-strung the efforts to establish the part-time work by making the establishment of part-time schools entirely optional with the local communities. This means that even in some places where the work has already started in an attempt to prepare for the mandatory law, the efforts will be abandoned. Some of the lazy superintendents, penurious boards, and reactionary state officials will now wink and give a sigh of relief, while multitudes of boys and girls will go on in their hopeless tasks without a chance for improvement and with but indifferent, if any, interest on the part of schools and school authorities in their welfare.

This action means that the friends of this new type of education in Illinois must continue the fight. Much of the same ground will have to be fought over again that has been covered in the last decade, and the forces of reaction and obstruction will have to be overcome again.

The opposition to the establishment of part-time schools in Illinois has used the argument of economy and lack of funds. In the light of certain current charges and countercharges now filling the press, it would appear that Illinois has money for everything else except proper care of its schools and adequate educational facilities for its working boys and girls.

"I have been in the position of directing the work of men since I entered the Army at the age of nineteen. For seventeen years I was an officer in the United States Army, in the position of a commander, backed up in my authority by the Articles of War, and in position to compel obedience to my will without question; but I learned early in my career that the obedience of fear led to mediocrity and that to get the best out of my men I had to secure cheerful performance of duty. I had to obtain discipline and compliance with regulations through a desire on the part of the man to make his troop the best in the service. The only way in the world to secure that spirit is to make it possible for every man to know what you want. This means frequent talks, mutual understanding, confidence, and loyalty."—*Brigadier General Brice P. Disque.*

Concentration is the secret of strength in politics, in war, in trade, in short, in all management of human affairs.—*Emerson.*

Replacement Work For Blind and Partially Sighted Boys and Girls

Helen J. Coffin.

The placement of adult blind in Cleveland is done by the Society for the Blind. A very interesting account of their placement work appeared in the late summer of 1920 in *The Iron Age,* also in the *Literary Digest.* The boys and girls who want to go to work when they leave the sight-saving classes and the classes for the blind are placed by the Department for the Blind, a department of the Cleveland board of education, and followed-up in their work for as long a period as seems advisable in order to give them a good start.

The aim of the placement worker is try to get a certain job for a certain boy or girl according to his or her inclination and ability, and with due regard to the amount of vision each has. One boy with partial sight in one eye has been working successfully for the past two years as a baker's assistant on bread and rolls. Another boy with only slight vision was placed as an assembler in a factory which manufactures hot water heaters. The problem of a blind worker was new to this firm and the boy was employed on trial. He proved a satisfactory as well as satisfied worker, and six months after being hired, he was still "on the job" making good progress. Still another boy was placed as an assembler in a factory making stove fittings. He was among the last laid off and the first rehired. This boy has enough vision to take shopwork in evening school, and he will undoubtedly have an opportunity to operate a machine later and do higher grade work.

The young boys are not advised to start in on any machine, even if their vision permits this, owing to the fact that a boy is often careless and lacking in judgment regardless of how much he sees. Too much care cannot be taken to place the inexperienced and youthful handicapped person on a job which will not require him to overreach his physical ability at the out start. It has been found that when the boy does satisfactory work on the particular job, he has been given other jobs, generally more difficult than the first. The question for advancement then becomes a matter for the foreman to adjust. The favorable attitude and the good will of the foreman is second in importance to no one's in assuring the boy's success.

There are several causes contributing to the comparatively few placements made during the year by this department, first among them being the fact that few boys and girls leave the classes during the school year to go to work. Another is the fact that the total number of boys and girls who have left school and are already working is not large. With these boys and girls who are handicapped by lack of sight in varying degrees we feel it is not numbers which count, but rather the satisfactory solution of the problem of work for each individual.

Although no figures are available to prove this, it has also been felt that the first job which the handicapped boy takes is held longer than the first job of the boy of like ability without the handicap. Several things may account in part for this situation,—the handicapped pupil has had the advantage not only of educational guidance during his school years, but he has talked about his chances for work from a much earlier age than his seeing playmates. The problem is necessarily a more serious one to him since he will not be able to go out and compete with other persons for as great a variety of positions. This not only tends to make him search for his work with earnestness, but endeavor to keep it by industry and close application.

Occassionally there are cases of such inherent laziness that *every* job is too hard, and the boy is not satisfied with any kind of work for long at a time, but on the whole the person without sight is especially eager to *do* things,—even the school vacations are long and tedious to him.

Although the segregated group of blind workers within an industrial plant, is advocated by some, and has been successful, it is, undeniable that excellent results can be obtained when young persons are placed individually among seeing competitors. In such a position they feel an added responsibility to do their work well. Moreover, many firms have been found willing to employ one or two workers where they were unwilling, or unable, to employ more. If persons are placed here and there, the handicapped workers are more widely distributed among the various industries, and more fields of work are open to them. In a city which has many industrial plants as Cleveland, this is also far more ideal from the point of getting the workers employment near their homes.

It is recognized that to get along with seeing workers the blind man or woman must be a good "mixer" and know how to get along with other people. In this connection it might be mentioned that such stress is being laid upon social education by this department in anticipation of the time when personality will count so much, not only in dollars and cents, but in happiness and helpful living. A pleasing personality, an easy manner in meeting people, ability to contribute to the enjoyment of others in some way are of inestimable value in helping a blind person to make a success of his work.

As has been mentioned above, vocational guidance is only a part of the work of the counselor in this department, educational and social guidance being considered as preparatory to the former. Not all the boys and girls go into the factory work. Some have taken up selling; one boy was employed two years in a wholesale creamery packing eggs and assisting in the delivery. One totally blind girl was employed in a paper box factory during the vacation folding boxes, and one was employed in a candy factory wrapping and packing chocolates. Both of these girls will complete their education before taking up permanent work.

Could every one of the processes of a modern industrial plant be offered for inspection by a competent person, who might judge of their possibilities for a blind worker, and such of these places as were adjudged suitable be filled by a blind person whenever there was such a person in the community, the employment of blind and partially sighted workers would be easily taken care of in any place, and to the mutual satisfaction of employer and employee.

It is a somewhat different and perhaps more difficult problem, requiring much skill and patience on the part of the adviser to place the person handicapped later in life. Vocational rehabilitation and satisfactory placement should be within the reach of every one handicapped by loss of sight. whether they served their country in the war, or met with the loss in some other way. The blind worker is not a dissatisfied worker, and all things considered is probably more satisfied than most of his seeing competitors, however just the cause of their grievances.

THE ART EDUCATION WE NEED.*

Leon L. Winslow, Specialist in Drawing and Industrial Training, University of the State of New York.

It is scarcely necessary to call attention to the importance of art as a controlling factor in the many industries where design is involved in construction as well as in decoration, and where the art element assures in a large measure, the salability of the product. In instances where salability is not dependent upon the aesthetic quality inherent in the product, art is employed in its advertising. As a result, art is coming to demand, more and more, the attention of manufacturers and of consumers. Consequently, renewed emphasis is being placed on art instruction in the schools.

Industry is interested in art primarily from the com-

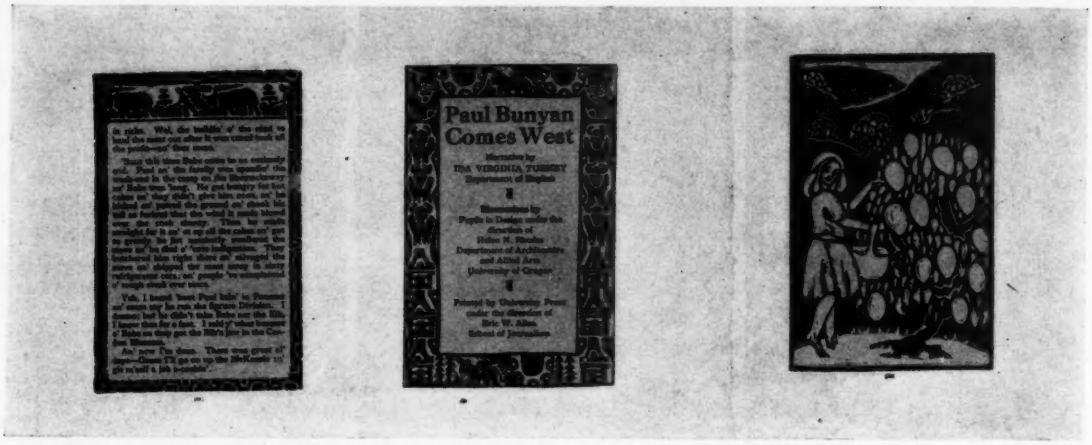
*From an address before The American Federation of Arts in Washington, D. C., May 20, 1921.

POSTERS PRODUCED BY ART CLASS, MADISON HIGH SCHOOL. MISS RACHEL SKINNER, INSTRUCTOR.

mercial side and it seeks to obtain skilled designers and craftsmen who can produce salable products. The manufacturer, all too frequently, hesitates to put on the market the most beautiful patterns which his designer produces, fearing that they may not appeal to the average buyer. He fails to recognize that public taste is often superior to industrial taste.

Educators are seeking to propagate and to perfect a higher type of art; they are teaching the public to appreciate it and trying to train designers and craftsmen to produce it. This will involve changes in art instruction and the combined efforts of all types of schools. To this end the elementary school must contribute its foundation in drawing, construction, and appreciation; the junior high school its appreciation and semi-specialized information and skill; the senior high school its deeper appreciation and more fully specialized information and skill; and the evening school its practical instruction for the worker employed during the day. In all types of schools much emphasis will have to be placed upon materials and their transformation into finished products.

Back of the entire system of art education there must be set up a thoroughly effective system of teacher training capable of supplying directors, supervisors, and special teachers for all the various types of schools enumerated above. Scholarships must be founded to enable talented pupils to pursue advanced studies; our large manufacturers will have to be convinced of the value of establishing similar scholarships for the improvement of the designers and craftsmen already in their service.



The illustration above presents three greatly reduced pages from an artistic school publication, prepared under the direction of Miss Helen N. Rhodes, Professor of Normal Art, in the University of Oregon. The booklet from which the pages are taken is printed on rough hand-made Japanese paper and measures 7 x10 inches.

The stories which it contains are tales of the lumberjacks of the northwest, set down in frontier language by Ida Virginia Turney, of the Department of English.

The linoleum blocks were designed and cut by Miss Rhodes's students and are printed in a soft sepia brown.

As regards vocational and educational guidance, suffice it to say that art must be studied not only as it relates to painting and sculpture but especially as to its importance in advertising, costume, jewelry, printing and publishing, furniture, wall-paper, textiles, architecture and the decoration of interiors, in order that the pupils may become acquainted with the opportunities offered in the art industries for profitable and pleasurable employment.

This re-organization of courses in elementary, high and normal schools is only the beginning. There must, sooner or later, be established a group of schools for the industrial arts which eventually will be capable of training an adequate number of designers and craftsmen to plan and create the kind of industrial product which the American child is already being taught in the public schools to appreciate and to demand. I am convinced that European training can not develop the kind of industrial art that America must produce, if she is to hold her own in the international competition for commercial leadership which is already upon us.

The ideal type of industrial art school can only be realized through the unified efforts of all agencies concerned. It is not enough that industry, art, and education should strive for it; they must strive *together*. And back of all must ever lie the controlling force of public opinion. A campaign in which the schools, the museums, the art associations, the industrial organizations, and the labor groups all worked together harmoniously, would win for the United States of America the place in the industrial world to which the quality of her citizenship justly entitles her. The greatest need at the present time is for leadership in this movement.

PUBLICATIONS.

News Bulletin. Vol. 1, April, 1921, Pennsylvania Society for Vocational Education. William P. Loomis, Editor-in-Chief, Harrisburg, Pa. A monthly publication issued in the interest of vocational education within the state.

Mr. Uel W. Lamkin retired on July 1, 1921, as director of the Federal Board for Vocational Training in charge of Soldier reeducation. The office will not be filled by a new appointment.
large educational aspects of the work of the board and several government officials commended Mr. Lamkin's work and wished him well in his return to private life. Mr. W. I. Hamilton, chief of training relations, outlined the problems to be met in vocational education, Mr. H. L. Brunson explained the work of the department of industrial relations, and Mr. R. T. Fisher contributed a word of appreciation for Mr. Lamkin's fidelity to the board.

The Department of Superintendence of the National Education Association will hold its 1922 convention in Chicago.

PORTION OF EXHIBIT OF GRADE WORK IN NEW BRUNSWICK SCHOOLS. MR. L. R. PARK, INSTRUCTOR.

PROBLEMS AND PROJECTS

The Department of Problems and Projects aims to present each month a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration. The editors will not accept the old hackneyed problems of footstools, taborets, towel holders, etc., which have been made from time immemorial, ad nauseum.

Drawings and manuscripts should be addressed: The Editors, INDUSTRIAL-ARTS MAGAZINE, Milwaukee, Wis.

GATE LEG TABLE.

Lee M. Klinefelter, Norfolk, Va.

This table is a simplified form of the old-time gate leg table. The design has been modified so as to be within the reach of boys in the first year of high school, and in some cases in the upper grammar grades. When well finished, either in stain and varnish or enamel, it makes a very attractive piece of furniture, considering its straight lines, and simplicity of construction.

The stock required is such as is available in any manual training shop, and no turning or special tools are required. While mortise-and-tenon construction is shown in the drawing, dowel construction can, of course, be substituted.

The two pivot legs should be made slightly longer than the others, to allow for length lost in cutting off at the pivot. Methods for laying out the top will be found in any mechanical drawing text.

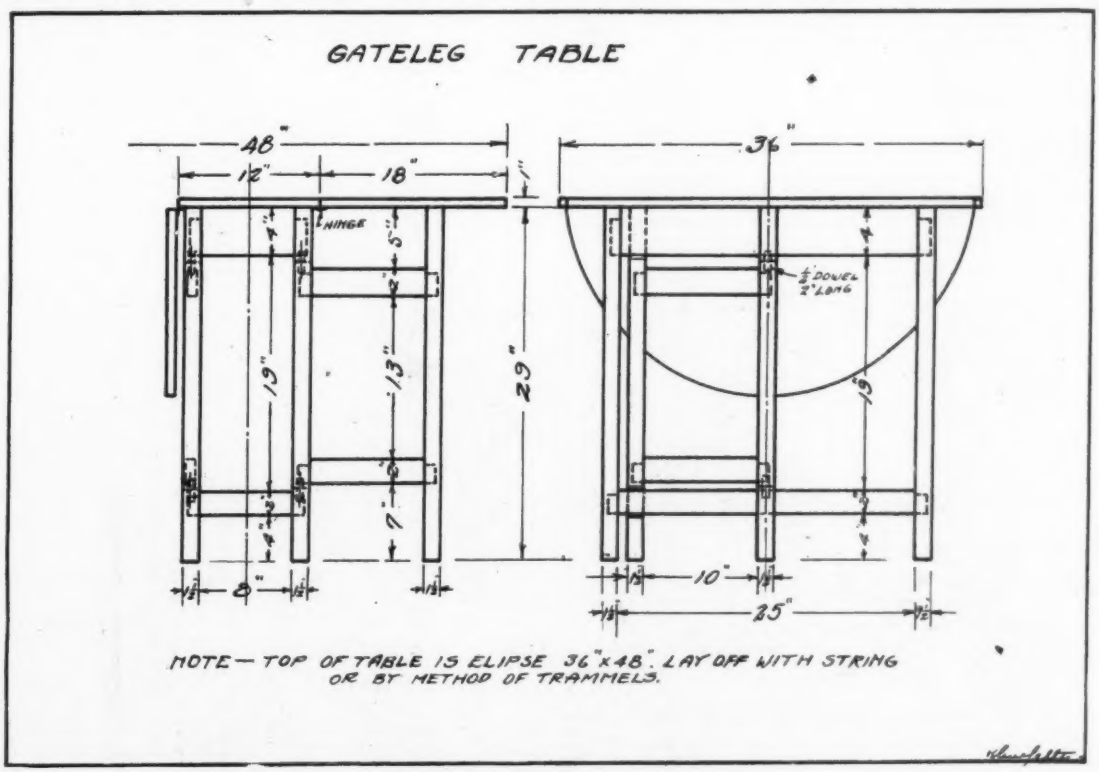
Both top and bottom of the drop leaves should be finished, as the bottom shows when the leaves are dropped, and also to preclude the possibility of warping in such comparatively large unsupported surfaces.

COMPLETED TABLE.

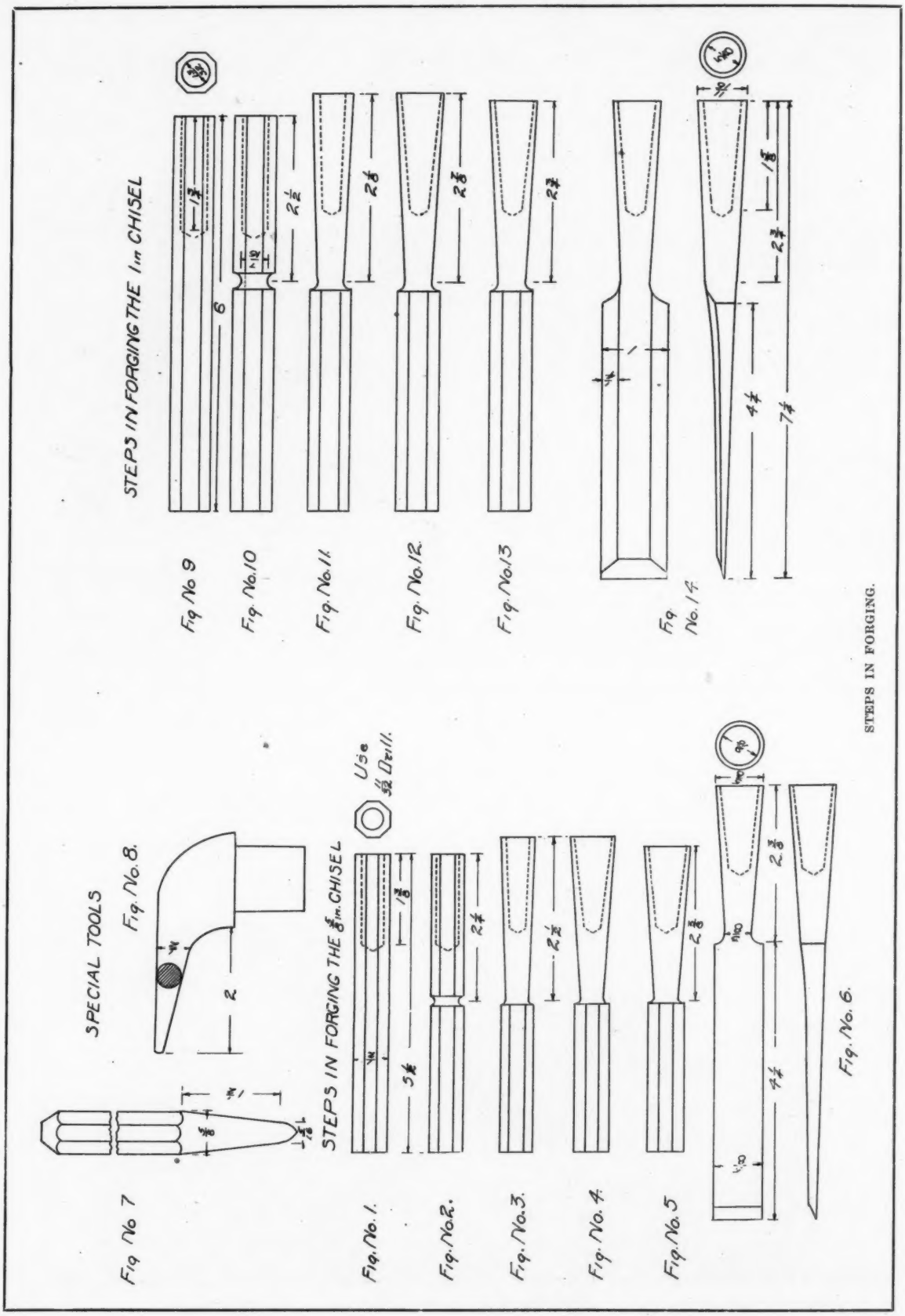
FORGING OF SOCKET FIRMER WOOD-WORKING CHISELS.

Jay F. Knowlton, Junior College Shop Instructor, Hibbing, Minn.

The wood working chisel is perhaps one of the best forging problems I have tried in the eighth grade. While the making of it requires skill to a small degree, it is simple; and the finished problem seems to satisfy the boy for the effort he has put forth. Then it is not one of those long-dragged-out problems of which a boy becomes tired, before it is completed. A boy knows what



DETAILS OF GATELEG TABLE.



STEPS IN FORGING.

a chisel is, he has used one, knows its value, and if he does not long to own one, his father perhaps does. As a problem in the school shop, from the instructor's standpoint, it has some very good points. It combines the different operations learned in the iron work, with perhaps the addition of the tool steel drilling and drifting. The forming of the socket is a new operation to nearly every boy, and one on which time can well be spent. The blade must be kept straight from the tip to the smaller end of the socket. The tempering is important and can be easily tested by cutting end grain oak, using a mallet.

The regular grade of octagonal cast tool steel can be used, but better results can be obtained by using steel of a higher grade. The three-quarters and smaller chisels can be forged from ½-inch stock, and when cut 5¼ inches long it will make a chisel with a 4¼-inch blade. If a longer blade is wanted, the stock will have to be cut accordingly. This length works best with the boy as it is far easier for him to keep such length straight while forging and tempering.

The steel after being cut to size, must be thoroughly annealed by heating to a bright red, and placed in air slack lime for several hours to cool. This is necessary if one expects to drill the hole shown in Fig. No. I.

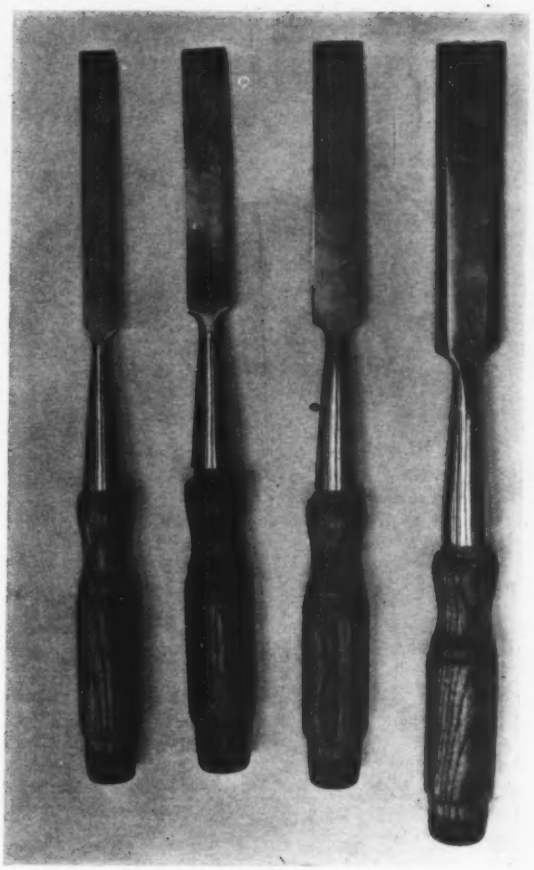
After the steel has cooled in the lime, it is removed and one end is filed square, on which is marked the exact center. This is center punched and the hole is now drilled with the 11/32 drill to a depth of 1⅜ inches. This of course must be drilled straight, and, if no better device can be had for drilling, a square block of wood with a straight hole drilled in it to hold the steel, may be used. If the drilling is not kept straight, it will be impossible to put a wooden handle in the chisel straight, when finished.

Now with the ¼ inch top and bottom fullers, fuller 2¼ inches from the drilled end, to ⅜ inch thick as shown in Fig. No. 2. Then with the use of the special tool shown in Fig. No. 8, draw the edge of the socket out a little thinner, and forge down to shape shown in Fig. No. 3 and 4. The socket is now complete, except the finishing of the inside of the socket. This should now be done by placing the octagonal end in the vise, and while the socket is red hot, drive the drift shown in Fig. No. 7 into the socket, until it is shaped to the required size. Notice that this will, of course, make the socket end of the chisel a little shorter. Now heat the socket, place the drift in the socket again and straighten on the anvil.

You are now ready for forging the blade. It is here that great care should be used to prevent overheating the steel. Draw the blade to size slowly and evenly, remembering, that while a low heat may take a little longer it will in the end pay, in the form of a keen cutting chisel of an even temper. After the blade has been forged to size, it is well to take a few dull red heats and with a perfect faced hammer smooth the blade, never striking after the color has disappeared. The blows should be even, light, and fast which tends to refine the grain of the steel. Now heat to the same dull red, and place in the lime to anneal, which will remove any forging strains.

The chisel is now ready for rough grinding, after which, the straight side of the blade is draw-filed until it is perfectly straight and you are free from a rounding, cutting edge. It is now buffed all over from the 40 to the 120 grade wheel after which it is ready for tempering.

To temper, heat the blade to a cherry red and quench in oil. The blade should be hardened two-thirds of the length. It should now be examined to see if it warped in hardening. If it did, it must once more be heated and straightened. If it is still straight, the temper can be drawn over a hot iron to the first shade of blue. The socket and top part of the chisel should be drawn until all temper is gone. The chisel can now be ground and tested on the end grain of hard oak and its condition as you can harden at, the less liable the chisel is to warp. A much better chisel will be had if the forging of the blade is all done at a low heat, as stated. If you overheat or forge at a very high heat, you must expect an open grain steel and a chisel that will not stand up at any temper.



SOME OF THE CHISELS MADE IN THE AUTHOR'S CLASS. HOME MECHANICS CLASS.

The one inch chisel is forged (Figs. No. 9 to 14) in the same manner, except use ¾ octagonal steel in place of the half inch. The socket must be a little larger, to take the second size handle. The taper in this size socket is the same as in the first one. So it is only necessary to drive the drift to the full depth, which will give a ⅝-inch opening. The one inch chisel has a bevel as shown in Fig. 14 which can be made by roughing off on an emery wheel and then finishing with a file. Draw file in finishing so as to remove all unevenness.

The special tools to be used are very simple and can be made without a great amount of trouble. Fig. No. 7, or the drift, is forged from the regular ⅝-inch octagonal tool steel and the taper must be perfect if the handles are expected to fit firmly. After forging it can be placed in a lathe and smoothed, or the same results can be had by grinding on the flat side of an emery wheel. It will be well to have a regular chisel socket to try your drift in, to see if the taper is perfect, and to locate the depth to which the drift must be driven to give the size required. This tool does not require tempering.

The special tool shown in Fig. 8 is forged from square steel. Fuller and draw out the shank to fit into the hole in the anvil. Draw the other end to a round taper as shown, then heat, place in anvil and bend to shape shown. This does not need to be tempered.

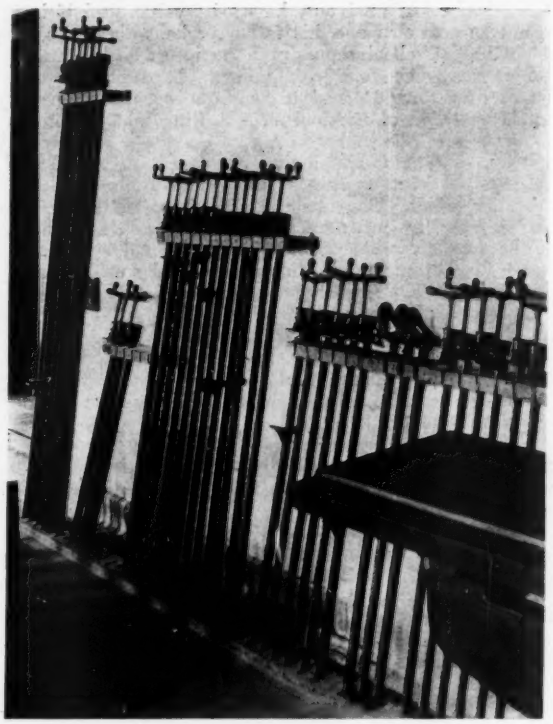
A very good scratch-all can be made by forging a socket as shown and then drawing the part used for the chisel blade into a round taper point.

RACKS FOR HANDSCREWS AND CLAMPS.

Herman Hjorth, Director of Technical Work, Roman Baldorioty de Castro Graded and Technical School, San Juan, Porto Rico.

The two racks for handscrews and bar-clamps, designed by Mr. J. C. Armstrong and the writer, have been found to be very convenient and efficient. They have the advantage that any handscrew or clamp may be taken out or replaced rapidly, without removing or disturbing any of the others. Furthermore, the racks take up very little room and hold the handscrews and clamps securely.

Racks of this kind should be built to accommodate the exact number of handscrews and clamps belonging to the shop, so that the different sizes can be put in the places provided for them, and so that the number may be easily checked.



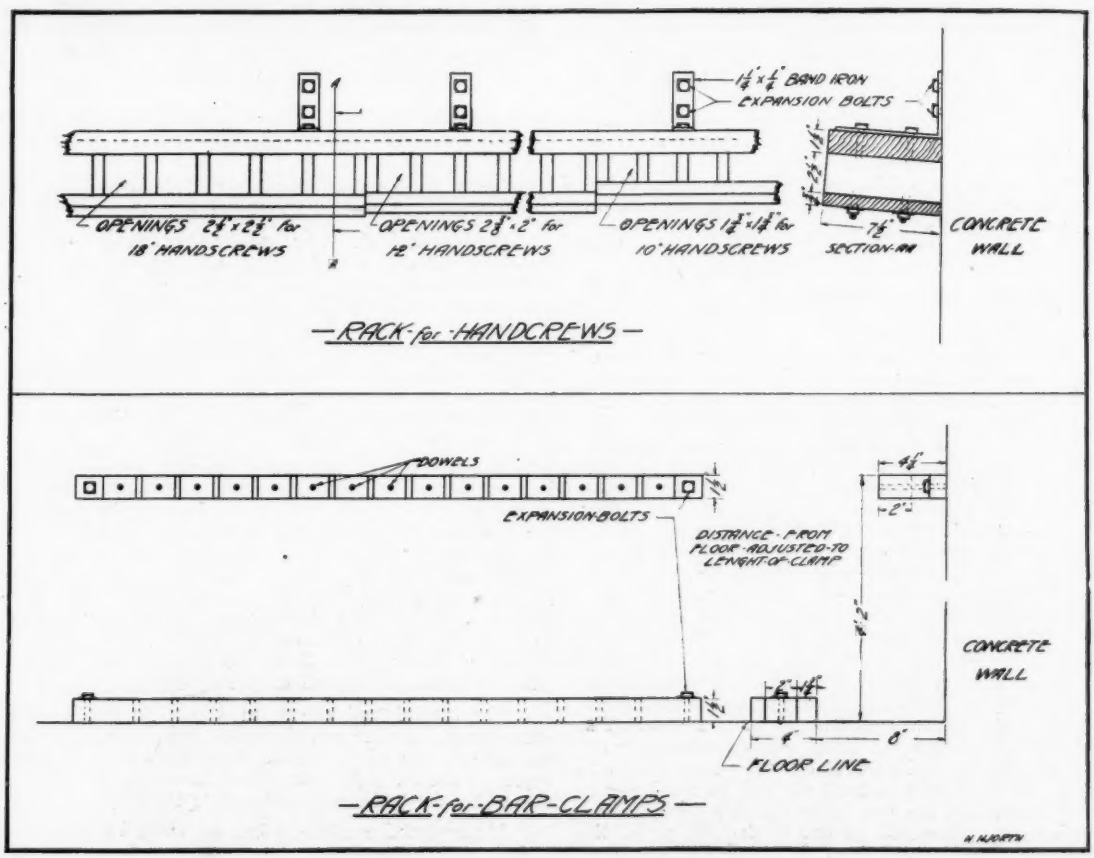
COMPLETED RACKS

HARDWARE CABINETS.

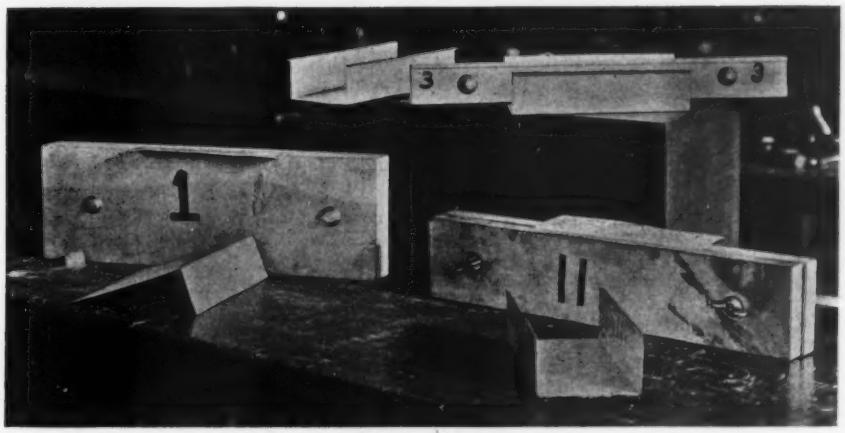
Arthur F. Ryan, Trenton, N. J.

In all up-to-date hardware stores you will find the stock kept in cabinets with metal drawers. To keep near this practical method and to do away with a lot of small boxes made of wood, we have made some cabinets in our eighth grades, using galvanized and black iron for the drawers with soft wood fronts and partitions.

We planned the cabinets so as to save material. Two sizes were selected as standard. One with drawers 12″ deep, 3½″ wide and 1¾″ high. The other 8″ deep, 3½″ wide and 1¾″ high. The iron was cut from sheets No. 26 gauge, 8 feet long by 24″ wide. The sheet gave us cuts without waste and made our cost three cents for small size and four cents for large size. After being cut with hand shears, each piece was placed in double block Number One, which is 5½″ wide. Then in block two which is 3½″ wide. Then to block three which is 1¾″ wide. The top edge or "turnover" should be ¼″ providing all pieces were



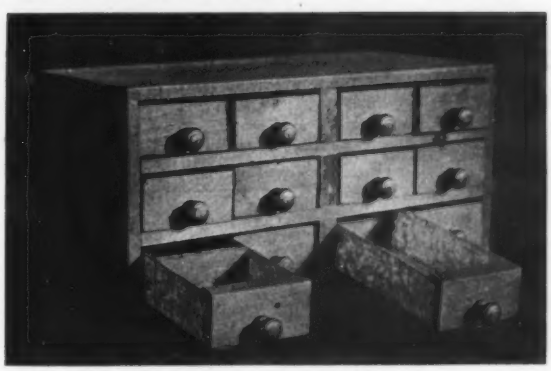
DETAILS OF RACK FOR BAR CLAMPS.



METAL PARTS OF DRAWERS AND JIGS FOR BENDING THE SAME.

8″ wide in starting. This "turnover" is hammered flat. The iron was purchased at six cents a pound and a sheet weighs about fifteen pounds.

The front blocks were rabbeted 1/15″ deep by $\frac{1}{2}$″ wide on the bottom, when in strip form, and same carried around ends by being put in the mitre saw. The fronts and partitions were stained, then nailed in place with No. 16 flat head nails. Side clearance of $\frac{3}{8}$″ for every two drawers was allowed in cabinet frame and $\frac{1}{4}$″ clearance for top and bottom.



A CABINET READY FOR USE.

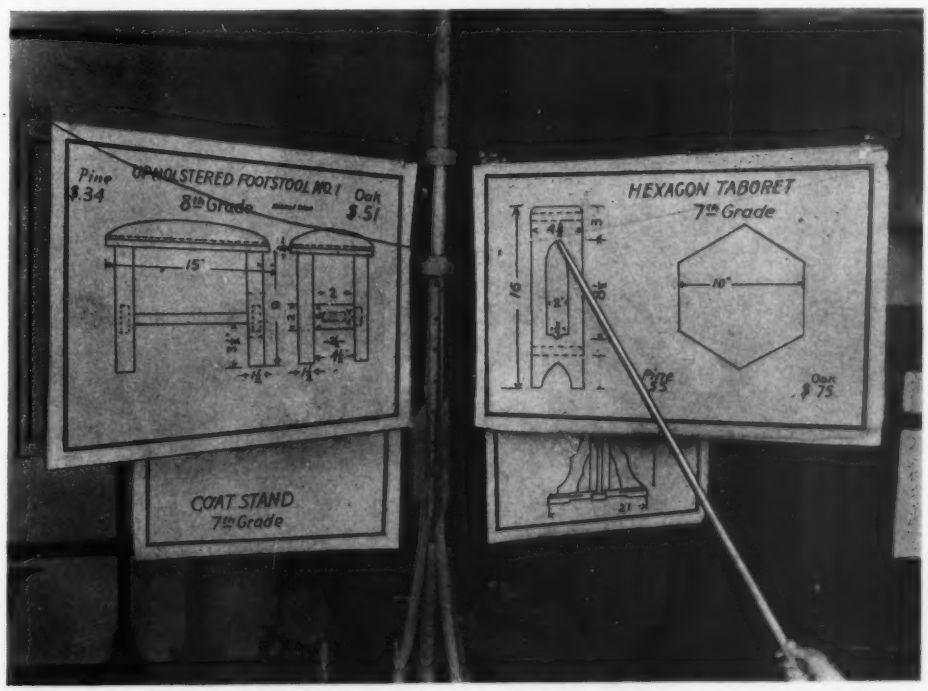
PRESENTING CLASS PROBLEMS.

W. S. Morgenthaler, Great Falls, Mont.

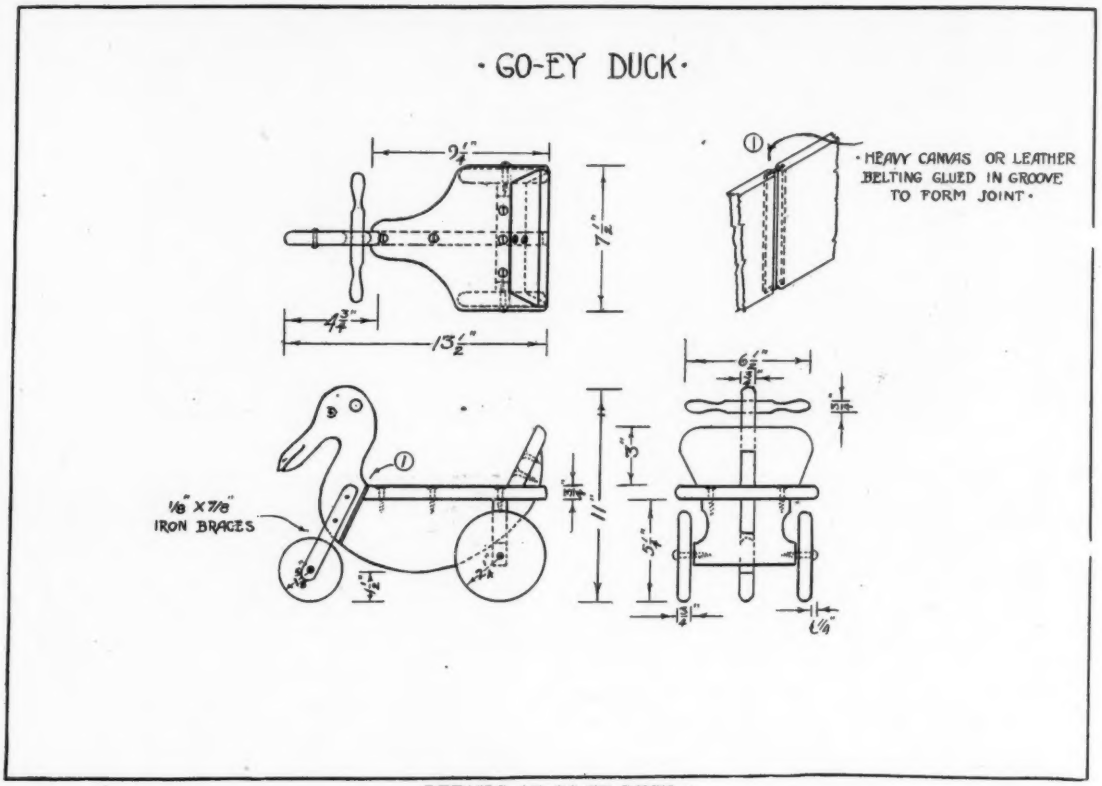
As a method of presenting class problems to pupils, the following has been used successfully for seventh and eighth grade work in the Great Falls schools. Instead of the customary blue prints and blackboard drawings, projects are drawn on large sheets of tough wrapping paper. These are similar in size to blackboard drawings, being 24 by 36 inches and are made with lumber crayon. The accompanying illustration shows drawings mounted on rack where they are easily accessible.

The advantages claimed for this plan are as follows:

First—The drawings are always accessible and are permanent.



THE DISPLAY RACK AND TYPICAL DRAWINGS.



DETAILS OF GO-EY DUCK.

Second—They have all of the merits of blackboard drawings for classroom discussion and being of a permanent nature can be kept for ready reference.

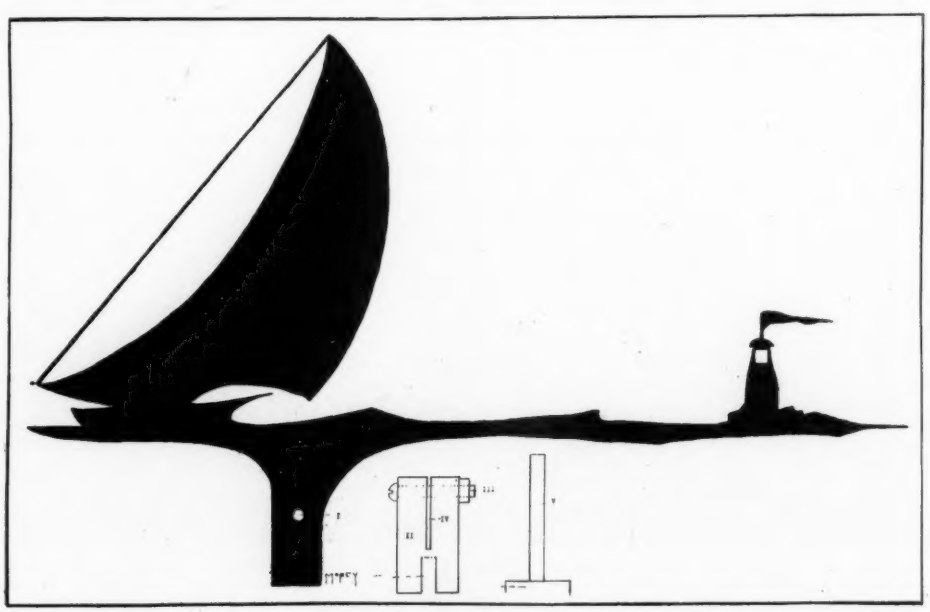
Third—With this scheme they can be kept up-to-date and a number of plates of the same project are not needed as with blue prints. A popular project can thus be preserved for the use of others with a few minutes' work.

Fourth—Another factor not to be lightly considered is that a correct atmosphere, created by the presence of full-sized wall drawings about the room. In seeing the finished article worked out from these drawings the pupil receives a knowledge of value beside that acquired from his own project.

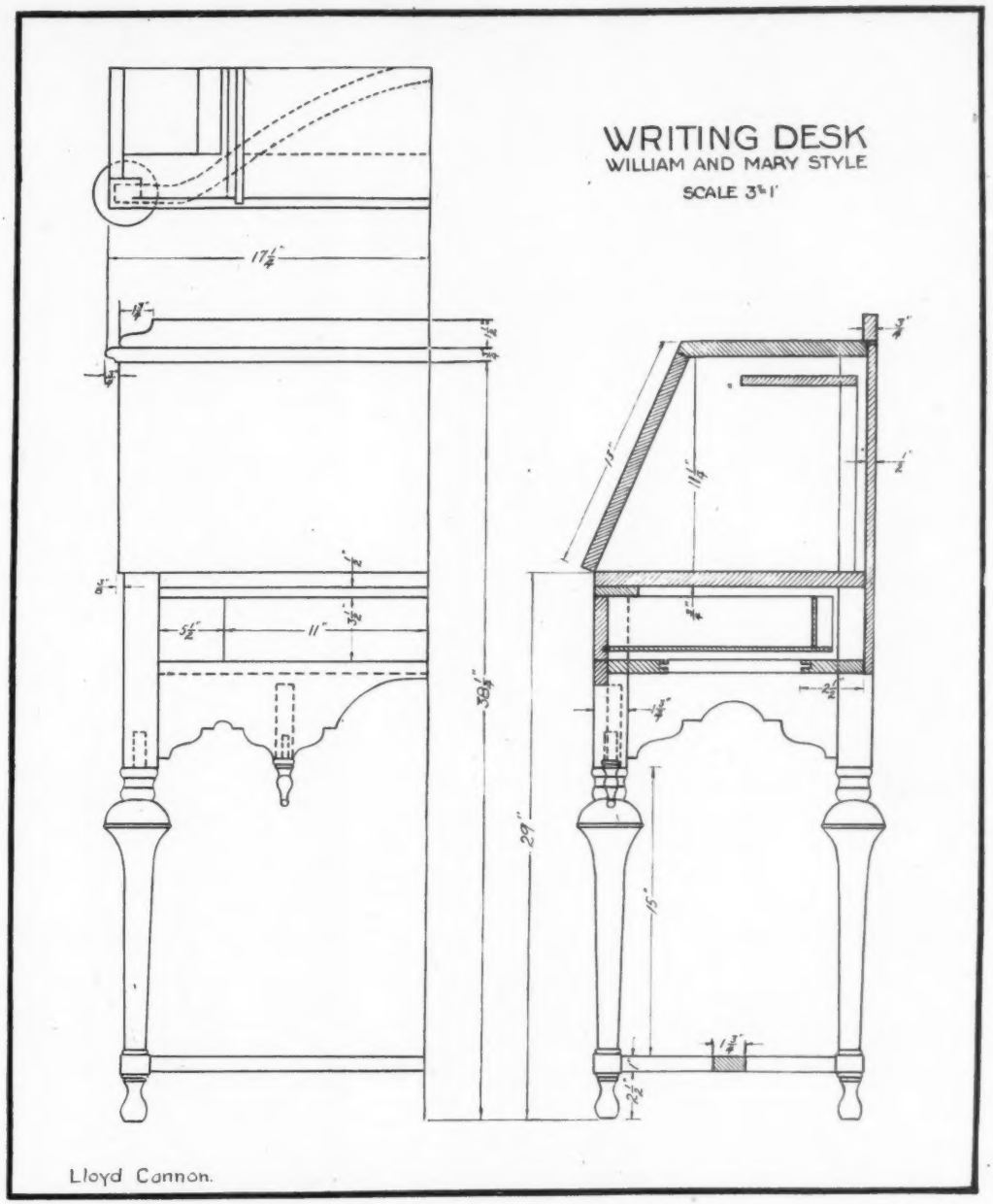
GO-EY DUCK.

H. R. Porter, Bellingham, Wash.

This is a variation of the much used "kiddie kar" and is designed to meet the requirements of the very little boy or girl. The wheels should be made of some hard wood but the body may be made of pine. As shown in the drawing a piece of canvas or leather belting is glued into grooves to form a flexible joint. This forms a very strong hinge arrangement and is not as unsightly as strap hinges would be. It may be painted in naturalistic colors.



THE WEATHER VANE.



DETAILS OF WRITING DESK.

THE WEATHER VANE.

B. G. Morey, Ottumwa, Iowa.

A very interesting weather vane may be made of a sheet of zinc, brass, copper or thin wood. The metal ones are more serviceable. The metal should be of about 15 or 20 gauge in thickness. After the design is drawn or traced on the metal, saw out the vane. The edges should be smoothed with a file and sandpaper. A short section of broom handle is used for the holder of the vane. The hole (VII) swings over the pivot (V). The section of the broom handle should be extended to allow the hole (VII) to be the length of the pivot (V). This pivot may be made of a very large nail. The top of the pole supporting the pivot is shown in (VI). The saw cut (IV) holds the vane and after slipping in place firmly bolted in place by running the bolt to the opening (I).

Practically the same directions are used for the vane of thin wood. The cut (IV) should be wide enough to carry the extra thickness of wood. Three-ply basswood is the best material for a wooden vane. The wooden vane may be painted dark blue for the ocean, black for the hull, white for the sail, gray for the rocks, dark gray for the lighthouse and red for the flag.

A WRITING DESK.

F. R. Love, Director of Manual Arts, Stockton, Calif.

This writing desk was designed and made by a student in the advanced cabinet making and turning classes. The design is a modification of the well known William and Mary and was made by a Japanese boy in his second year of work. The desk as well as the chair were completed in one semester.

NOW, ARE THERE ANY QUESTIONS?

This department is intended for subscribers who have problems which trouble them. The editors will reply to questions, which they feel they can answer, and to other questions they will obtain replies from competent authorities. Letters must invariably be signed with full name of inquirer. All questions are numbered in the order of their receipt. If an answer is desired by mail, a stamped envelope should be enclosed. The privilege of printing any reply is reserved. Address, Industrial-Arts Magazine, Milwaukee, Wis.

Wood Refinishing.

219. Q:—(1) I have the job of refinishing a house this summer and would like some practical information in regard to, (a) revarnishing floors, (b) refinishing linoleum, (c) painting windows, porches, etc., (d) painting porch floors exposed to weather.

(2) I have an old car to finish. I should like to know the proper method of finishing an automobile from the bottom up, including the removing of the old varnish.

(3) What grade of varnish would you recommend for a "rub finish" suitable for manual training purposes?

A:—(a) **Revarnishing Floors:**—If in poor condition remove old varnish by use of varnish remover; hot solution of Gold dust using two pounds to a twelve quart pail of boiling water applied with a broom or scrubbing brush and allowed to remain long enough to thoroughly soften the varnish. The destroyed varnish and dirt should be washed up thoroughly with plenty of hot water and allowed to dry. It should be sponged over with vinegar to neutralize any free alkali remaining in the cracks. In three days the floor can be filled with a tinted Silex filler which should be allowed to harden at least forty-eight hours. The floor may then be given a coat of Pratt & Lambert No. 61 Floor Varnish or equal supplied by local markets allowed to dry at least a week, sandpapered lightly to remove the gloss and revarnish. The floor should be allowed to dry at least a week before using. Do not use any shellac under varnish for floor work.

(b) **Refinishing Linoleum:**—Thoroughly scrub or wash up the linoleum by using one cup of Gold dust in twelve quart pail of hot water, allow to dry at least two days, then wash with vinegar and allow to dry thoroughly. It may then be varnished as for floor work omitting the filler.

(c) **Painting window sills, etc.:**—Old paint should be thoroughly scraped off down to raw wood and primed with a good commercial undercoater and sanded smooth. It should be then given one or two coats of good white enamel since this will outwear ordinary paint a great many times.

(d) **Porch Floors:**—Porch floors should be painted with deck or porch paint prepared especially for this purpose and if such are not available may be made from white lead and oil to which turpentine and varnish have been added to make a very hard drying gloss paint. I have often found that the addition of one-half pound of flake litharge in the undercoater, at least has very beneficial effect. (one-half pound litharge per gallon of prepared paint.)

(2) Refer to the April, 1920, issue of the INDUSTRIAL-ARTS MAGAZINE, page 146.

(3) I find that Keystone Co. Degrah, Pratt & Lambert Rubbing No. 110 are very good varnishes for shop use. In trade school practice where school supplies and furniture are manufactured, I believe that Pratt & Lambert No. 61 is by far the best material for both rubbing and polishing coupled up with extreme durability. Murphy's Univarnish is also very good.—Ralph G. Waring.

Electric Stove.

229. Q:—We are making an electric stove and would like to have the names of the manufacturers who could supply us with heating units for this purpose.

A:—The following manufacturers can supply you with units for an electric stove:

General Electric Company, Schenectady, N. Y.; Driver-Harris Co., Harrison, N. J.; Hoskins Mfg. Co., Detroit, Mich.; Electrical Alloy Co., Morristown, N. J.; Cutler-Hammer Mfg. Co., Milwaukee, Wis.

Sun-Dial.

228. Q:—I am desirous of securing information relative to the laying out and correct placing of sun-dials?—H. C. R.

Material for the making of sun-dials may be obtained from the following books and magazines:

"Bond's Scientific American Boy," $2, Munn & Co., New York City; "Gatty's Book of Sun-Dials," $10. Macmillan Co., New York City: "Thonger's Book of Garden Furniture," $1, John Lane Co., New York City; "Underwood's Garden and Its Accessories," $1, Little, Brown & Co., Boston; "Spackman's Timepiece of Shadows," $1.50, W. T. Comstock, New York City.

"Eaton's My Home-Made Garden Pool," Country Life, April, 1920, Doubleday, Page & Co., Garden City, N. Y.; "King's Garden Sun-Dials," International Studio, Sept., 1916, John Lane Co., New York City; "Sun-Dial for Garden Wall," Craftsman, August, 1916, Craftsman, New York; "Robinson's Making a Sun-Dial," Country Life, Feb., 1917, Doubleday, Page & Co., "Riblet's Sun-Dial for a Colonial House," Garden Magazine, Jan., 1917, Doubleday, Page & Co.

IDENTIFICATION OF OAK WOODS.

Over fifty species of native oaks assume the proportions of trees, and about twenty-five are used for lumber. After the oaks are cut into lumber, there is no means known to the U. S. Forest Products Laboratory by which they can be identified as to exact species. By examination of the wood alone, however, it is easy to separate the oaks into two groups—the white oaks and the red oaks; and for most purposes, fortunately, it is not necessary to classify them further. The oaks all average about the same in strength, but those in the white oak group are much more durable under conditions favorable to decay than those in the red oak group.

The white oak group includes true white oak, swamp oak, bur oak, cow oak, post oak, overcup oak, and chestnut oak. The red oak group includes true red oak, yellow or black oak, scarlet oak, Spanish oak, Texan oak, black jack, water oak, willow oak, and laurel oak.

The color of the wood is a ready but not absolutely reliable means of distinguishing the white oaks from the red oaks. Red oaks usually have a distinctly reddish tinge, especially near the knots. The wood of the white oaks is generally a grayish brown; but occasionally a reddish tinge is found in white oak lumber.

For more accurate identification it is necessary to examine the pores of the wood. These will be found as tiny holes on a smoothly-cut end surface, the largest being visible to the unaided eye. They are not of uniform size thruout each growth ring, but are considerably larger in the wood formed in the spring, decreasing in size rather abruptly towards the summerwood. The large pores in the springwood of the heartwood and inner sapwood of the white oaks are usually plugged up with a froth-like growth called tyloses, and those of the red oaks are open. This feature, however, is not so reliable for classification as the character of the much smaller pores in the summerwood.

To tell for a certainty whether a piece of oak belongs to the white or red oak group, cut the end grain smoothly with a sharp knife across several growth rings of average width. With the aid of a hand lens examine the small pores in the dense summerwood. If the pores in this part of the growth ring are plainly visible as minute rounded openings, and are not so crowded but that they can readily be counted, the wood belongs to the red oak group. If the pores in the summerwood are very small, somewhat angular, and so numerous that it would be exceedingly difficult to count them, the wood belongs to the white oak group.

Educational Work of the Commercial Museum of Philadelphia. By Charles R. Toothaker. Bulletin No. 13, 1920, U. S. Bureau of Education, Washington, D. C. The Museum was organized on June 15, 1894. It is governed by a board of trustees of prominent businessmen and is supported by appropriations from the city, from the state of Pennsylvania and by subscriptions from manufacturers and merchants in the United States for special service along commercial lines. A very active and important educational work is carried on under the department of exhibits, the main object of which is to teach the rising generation the basic facts and principles which underlie modern industry. The pamphlet describes the several educational activities under the headings of study of exhibits, daily lectures, special lectures for teachers and others, loan lectures, and school collections or miniature museums, which are given free of cost to schools for class use. Among the exhibits are rubber, wheat, iron, coal, wool, corn, cotton, turpentine and a number of the producing industries.

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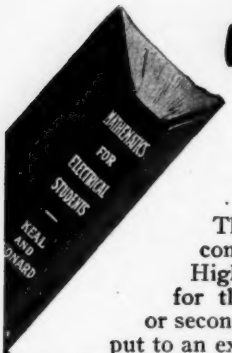

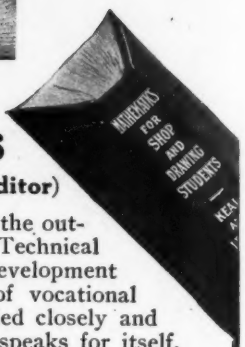

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NEWS AND NOTES.

Day School for Unemployed. The University Extension branch of the State Education Department of Massachusetts has opened classes in industrial cities and towns for the unemployed. The courses taught include practical mathematics for the several trades, business English, Spanish, commercial correspondence, salesmanship, accounting, blueprint reading, steam and gas power engineering, civil service subjects, textile calculations and preparatory design. The classes are held in the daytime and a nominal fee is charged for textbooks and materials.

Vocational Work Shown. Work in wood turning, machine work and mechanical drawing was shown at a recent exhibit of the vocational school at New London, Conn. Among the articles exhibited were library tables, cabinets, candle-sticks, and table lamps. The wooden articles were retained by the pupils who made them, while the metal work was sold to factories which could use such pieces.

Exhibit Work. Hand carved and painted toys, gingham dressed dolls with painted faces, kitchen utensils and a piano bench were included among the articles exhibited by the pupils of the ungraded school at Hartford, Conn. The toys and animals were original in design and of a most interesting character.

High School Exhibit. The high school manual training shop at Bridgeport, Conn., recently held an exhibit of work in machine shop practice, carpentry, and printing. Wood articles such as writing desk, cedar chest, fern stand, writing table, and electric lamp were shown. The printing department demonstrated the fundamental rudiments of printing, while the machine shop exhibited motors, clamps, hammers, gauges, chisels and andiron work.

Practical Handwork for Boys. A practical result of the English Education Act is the provision for practical instruction in handwork for older boys in the schools. The usual present-day course has been discarded with the decision to enlarge the scope of the work to include the various types of handwork which have previously been attempted in only a few individual schools. It is proposed that instruction shall be given in gardening, bookbinding, basket making, weaving, knotting and splicing, cobbling, printing and various forms of art crafts. The work is to take the form of problems, the emphasis being placed on the practical effect of the work rather than the development of skill.

Trade School for Colored Boys. An all-day carpentry school for colored boys has been opened at Indianapolis, with an enrollment of twenty students. The course covers two years and is open to boys who have completed the eighth grade. The work which is conducted in accordance with the state requirements, provides for three hours of shopwork and three hours of related academic work.

Vocational Agriculture in Kansas. More than 2,000 boys in the Sunflower State will receive instruction in agriculture this fall as a result of the addition of thirty high schools to the 45 already established. The existing schools gave instruction to 1,200 boys in twenty counties last year. Fifteen of the new schools have already been approved by the state director and at least 25 more schools will be ready for the work as soon as funds are available.

To Erect Vocational School. Newark, N. J., recently held a municipal bond sale, the proceeds of $1,800,000 to be used in the erection of the Seymour Vocational School, and additions to three graded schools.

Large Enrollment. The Cohoes Continuation School at Cohoes, N. Y., closed the school season with an enrollment of 126 pupils. This number is considered very large in view of the fact that all of the pupils were between 14 and 16 years of age. All of the pupils will report for classes again in the fall since the law requires that they must attend until the eighteenth birthday has been reached.

Restrict Vocational Fund. The Arkansas State Board has continued the policy of restricting state and vocational funds to the rural communities. The money is used for the advancement of agricultural training in the public schools as an auxiliary to the state agricultural schools.

Apprentice Seaman's Course. One thousand boys between the ages of 16 and 20 years were given an opportunity of attending a vocational school at the Great Lakes Naval Training School, Great Lakes, Ill., during the

(Continued on Page XXIV)

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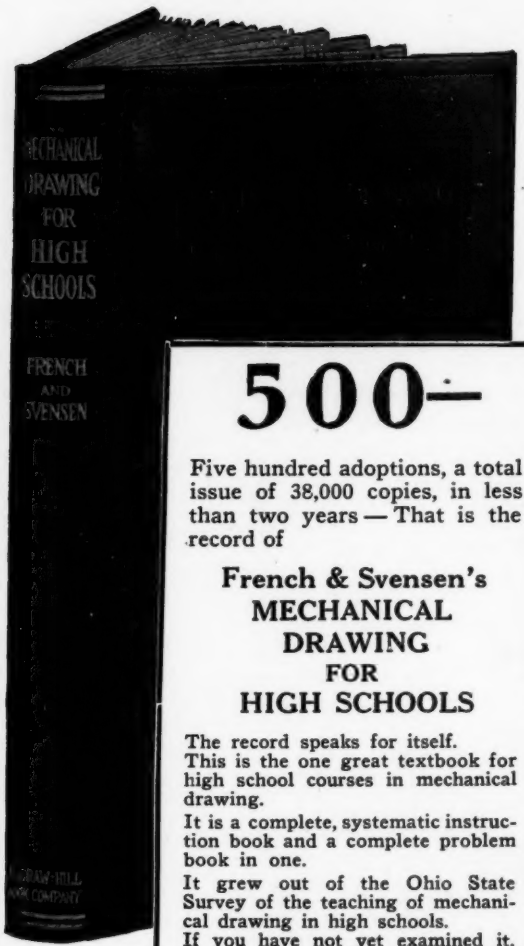

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(Continued from Page XXII.)

month of June. A six weeks' course was offered and each student was paid the apprentice seaman's wage of $33 a month.

Growth in Vocational Education. More than twenty high schools in Texas will offer vocational training courses during the next school year, as a result of increased interest in vocational and industrial subjects. The increased interest is also due to the fact that high schools receive federal aid for vocational training.

School for Soldiers. A vocational school for disabled soldiers, sailors and marines has been established at Bellevue College, Omaha, Neb. The school which opened on July 15th, has accommodations for 300 students. A corps of twenty teachers, headed by Prof. S. O. Brown, is in charge.

Vocational High School. A vocational high school has been established at the Geraldine school, Sand Mountain, in DeKalb County, Ala. Mr. A. B. Hall has been employed as instructor.

The Largest University. The Federal Government reports that a total of 83,504 students, all former service men and women, are enrolled in thousands of educational and training institutions maintained and operated for the government. Industrial training has claimed the interest of the greatest number, 33 per cent, while business and commercial lines have attracted 26 per cent. Fourteen per cent seek professional careers and twelve per cent are fitting themselves for farming. A few are giving their attention to prevocational training.

The overhead expense of the board for vocational education has been very low. Up to March first, the board had spent $89,521,414 since the passage of the rehabilitation act two and one-half years ago. Of this amount, $68,000,000 have been spent for maintenance allowances. The overhead for the entire time for all purposes was approximately fourteen per cent, which later decreased to less than eight per cent. During the month of March, the total expenditures amounted to $11,044,330, of which $8,250,000 went directly to the men for maintenance. It is estimated that the overhead expense will decrease as the board approaches the maximum number of eligible trainees.

Class of Soldiers. A class for soldiers has been started at the Manchester high school, Manchester, N. H. The school which serves as a receiving station for men approved for vocational training, offers instruction in the three elementary subjects of reading, writing and arithmetic. Following the completion of the work, the students will be apprenticed in shops for the learning of their trades. The work is conducted in accordance with an agreement between the school authorities and the federal board of vocational education.

Trade Classes in Summer. The State Trade School, at Meriden, Conn., has continued its day classes for the summer with the decision to allow the students two weeks' vacation to be taken at the option of the student. Special short-time work is offered to boys over 12 years who desire to study any trade at the school. At present the school has an enrollment of 125 boys in regular day courses and thirty former service men who suffer from disabilities.

Offer Electrical Course. The high school at San Diego, Calif., will offer a complete electrical course next year with the addition of new equipment for the work. Plans have also been made for the establishment of printing and automobile departments in the new building to be erected at the rear of the high school.

Service Men Enter Training. A total of 75 veterans of the world war have entered upon an eight weeks' vocational course at the Morrill High School, Concord, N. H. Electricity and machine shop practice have claimed the interest of the majority of the soldiers who will later be placed in shops to continue their training for the chosen trade.

Large Vocational Fund Requested. The board of industrial education of Beloit, Wis., has asked for an appropriation of $17,000 for vocational work the coming year.

Vocational Instructors at Dunwoody. Vocational instructors representing every state in the union participated in a four weeks' conference held at Dunwoody Institute, Minneapolis, during July. The conference which took the form of an intensive summer school, had for its purpose the bringing together of the teachers and the nation's leaders of industry for the benefit of former service men who study under the vocational boards. The school offered instruction in two main topics, namely, trade and industrial work, and foremanship, and classes

(Continued on Page XXVII.)

A NEW AUTOMOBILE TEXT

AN IDEAL COMBINATION OF PRACTICE AND THEORY

Part I contains full instructions for doing 118 Practical Automobile Jobs.

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A practical, thorough instruction manual of repair jobs for the general repairman and the owner. **It also makes an ideal text-book for use in automobile schools and classes.**

In Part I the author gives 118 sample jobs—jobs that cover **every** phase of general repair work. Full directions for carrying out all of these jobs are given, as are also the trade terms and a list of the tools needed.

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The **extreme flexibility** of Wright's "AUTOMOTIVE REPAIR"—its adaptability for use in 50-hour, 100-hour or 300-hour courses—makes it an ideal all-round text for the general automotive student, giving under one cover **practice, instruction and theory.**

WRIGHT'S "AUTOMOTIVE REPAIR" will contain about 500 pages, 6 by 9. It will be fully illustrated with cuts of exceptional clearness, and the binding will be of durable cloth. The price has not yet been set.

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were conducted six hours a day. Mr. J. C. Wright acted as director of the school.

Vocational School to be Erected. The school directors of South Middleton township, near Carlisle, Pa., have awarded the contract for the new Boiling Springs Vocational School, at a cost of $48,596.

Vocational School for Boys. The first vocational school for boys in the state of Alabama will open in October at Hadley. The site for the school comprises 1,480 acres of land and the plans provide for twelve buildings, an administration building, dormitories, dispensary, trade building, garage and gymnasium.

Machine Shop Installed. The Union High School, at Benwood, W. Va., has installed a complete machine shop for the manual training department.

Announce Competition. The Fairchild Publishing Company has recently announced a competition for ideas in advertising for apparel and fabrics. Prizes totaling $1,000 will be awarded. Complete details of the competition may be had by addressing the Research Department of the Fairchild Publishing Company, 8 East 13th Street, New York City. Competition will close November 21 and the designs submitted will be put in the hands of a jury headed by Charles Dana Gibson.

Extend School Program. Plans have been made for an extension of the school program of Columbus, O., to make more adequate provision for part-time day and evening students. The need of a placement bureau for students who seek employment has been emphasized by a number of agencies.

Oppose Trade School Instruction. The Sheet Metal Workers' District Council of New England, at a recent meeting held in Portland, Me., opposed the establishment of free trade schools. It was urged that the schools offer educational advantages and leave the problem of trade instruction to the industries.

Graduate Class. The graduation exercises of the Bayonne, N. J., Vocational School, were arranged to reflect the trade character of the school. The students who participated read essays on work done by themselves in the school shops. The speaker of the evening dwelt upon 'The Boy in Industry." The class included 28 boys.

Announce Competition. The Art Institute of Chicago has announced that the Chicago Tribune has offered to the institute School a competitive prize of $5,000 for mural paintings to be installed in the "local editorial" rooms of the Tribune plant. All students of the Art Institute School will be eligible to enter the contest. The subjects for the three paintings will relate to important historic facts in the annals of newspaper publishing in the United States.

Stout Institute, Menomonie, Wisconsin, inaugurated a nine weeks' summer session June 27th. The enrollment in the Industrial Arts department reached two hundred and six men on the second day. This is larger than the enrollment of men at any previous summer session at The Stout Institute. It is significant in view of the fact that it is the first time the nine weeks' summer session has been offered instead of the five weeks session, which ran six days a week.

To Open Shops. The New York Board of Education proposes to open nine additional manual training shops and has included estimates for them in its 1922 budget. Mr. George Lowey, Director of Elementary Shopwork, has asked for additional funds to equip and maintain these shops. The sum of $881,156.94 has been approved by a committee of the board of education for manual training work in the elementary schools of the city in 1922.

Manual Training Exhibit. The Haddonfield Grammar and High School at Collingwood, N. J., held a manual training exhibition showing between 40 and 50 floor pieces including several large cedar chests, a number of electric motors made by eighth grade classes, art lamps designed and made by ninth grade classes from hard tack cans, and a violin made by a sophomore. The high school was notified that the violin was considered the best piece of woodwork turned out in the state of New Jersey during the past year.

The next annual convention of the National Society for Vocational Education will be held January, 1922, at Kansas City, Mo.

Starrett Service to Science—

No greater tribute can be paid to the quality of Starrett Precision Tools—no more weighty testimony rendered as to their reputation for accuracy—than is implied in the marked preference for these fine tools that has been exhibited by the makers of scientific instruments.

Upon the sensitiveness—the almost absolute accuracy of such instruments—have depended discoveries of immense importance to civilization.

In the making of these instruments, in which perfection of dimension and adjustment is so essential, the dependable accuracy of Starrett Precision Tools has for more than forty years been of invaluable assistance.

Starrett Catalog No. 22 "CE" sent free on request.

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ATHOL, MASS.

Starrett Tools

The National Association of State Directors of Vocational Education will hold its meeting the same week and in the same city selected by the National Society.

The two associations, in cooperation with others interested in this field of work, are working on plans for the publication of a magazine to be devoted to vocational education. During the present summer it is planned to issue a prospectus of the proposed magazine and to issue circular letters which will be sent to all interested people in September.

In order to formulate definite proposals for the work, a board of control has been appointed by the executive committee, which is to have power to develop arrangements for the publication of the magazine and to report to the committee at a meeting to be held in the fall of 1921. The committee will not enter into any financial arrangements involving the National Society.

The Isaac Delgado Central Trades School at New Orleans, La., during the month of June occupied its new building which is just reaching completion. The school has made a contract with the Federal Board for Vocational Education to take over the training of 100 to 200 soldier students.

Mr. Glenn Lukens has discontinued Red Cross work with which he was connected during the war, and has returned to teaching at Redwood Falls, Minn.

Miss Edna G. Benson of the Illinois State Normal University has been advanced to Director of the Art Department. Miss Benson spent the summer at Columbia University.

TO MEET IN MILWAUKEE.

The Vocational Education Association of the Middle West will hold the eighth annual meeting in Milwaukee in January, 1922. The exact dates will be announced later.

All general and sectional meetings as well as the commercial exhibits will thus be housed in the Milwaukee Auditorium under one roof. The arrangements will therefore be ideal so far as physical requirements for the meeting are concerned. Coupled with this ideal condidition is the enthusiasm and spirit of the Milwaukee local committee, which has organized under the auspices of the Association of Commerce, the public schools and other organizations, not of Milwaukee alone but of all the surrounding communities, Cudahy, West Allis, Wauwatosa, South Milwaukee and Sheboygan. A well developed working plan has been adopted and industrial and educational forces have set out to make this the biggest meeting on vocational education which has been held in the middle west.

The opportunity offered at this meeting to study the vocational education program of Milwaukee will be one which no one interested in this form of teaching can afford to miss. The part-time and continuation schools, the boys' trade school and the girls' trade school, pioneers in this line of work have kept far in the front in the movement during the past years. A study of this work at first hand is alone worth the trip to Milwaukee. School boards and superintendents are beginning to recognize the value of such study when coupled with a live convention and a good program and are sending members of their teaching and supervisory staff as delegates representing their schools and community.

The Vocational Education Association of the Middle West, by means of the successful meetings of the past has assumed a leading position in the section ranging from Ohio on the east to Kansas and Nebraska on the west and from Minnesota and the Dakotas on the north to Oklahoma, Missouri and Kentucky on the south. The convention of this association is the one big meeting of the year for this section of the country. The total number of members has increased from 263 in 1917 to 650 in 1921. The registration at the Minneapolis meeting in 1921 exceeded the total for 1920 in spite of the fact that the meeting of 1920 was held in the center of the territory and was a joint meeting with the National Society of Vocational Education.

In spite of increasing costs in every line and the fact that some educational associations have found it necessary to increase their dues, a dollar still pays for a year's membership in this association just as in days "before the war."

"A thousand members for Milwaukee in 1922—Let's Go!"

DIXON'S
ELDORADO
"the master drawing pencil"

An ELDORADO pencil in hand, and your pupil realizes the result is strictly up to him—for "the master drawing pencil" is as responsive and dependable in his hand as in the hand of a master.

SAMPLE OFFER TO TEACHERS.

Dixon's Eldorado is made in 17 leads. Tell us whether you teach Mechanical or Freehand drawing and we will send you suitable samples.

Joseph Dixon Crucible Co.
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JERSEY CITY, N. J.

High Schools Need Art Teachers. The Board of Examiners of the New York City Board of Education has announced examinations for licenses as teachers of freehand drawing in high schools, to be held at the rooms of the board, 500 Park Avenue, on Monday and Tuesday, September 19th and 20th, at nine A. M. each day.

The examination will consist of (1) a written test, (2) a technical test, (3) an oral teaching test. A new salary schedule provides for a minimum salary of $1,000 for an assistant teacher of drawing, with a maximum of $3,700 for the thirteenth and subsequent years of satisfactory service.

Partial credit will be given for previous experience in high schools of other institutions, in excess of the requirements of eligibility.

Training Courses for Teachers. The Vermont State Board of Education has announced two-year training courses for teachers, to be held in the fall at the University of Vermont, Burlington. In addition to these three two-year training courses, there will be 21 one-year courses in the high schools and academies of the state. The tuition is free to those who agree to teach for as long a period as the duration of the course. The general supervision of the courses is under the direction of Miss Katherine Aagersen.

VOCATIONAL CONFERENCE AT STOUT INSTITUTE.

The first vocational trade conference, for the purpose of making an analysis of trades and teaching the same in the vocational schools of the Badger state was held at Stout Institute, Menomonie, Wisconsin, under the auspices of the State Board of Vocational Education, with W. F. Faulkes, State Supervisor of Vocational Education in charge.

The members of this conference were tradesmen with seven or more years of experience in their respective trade, and have been engaged as instructors of trade work in the vocational schools of the state of Wisconsin.

The following trades were analyzed: Upholstery, machinist trade, cabinetmaking, carpentry, patternmaking, printing, sheet metal work, electrical wiring and repairs, and automobile mechanics.

The trades were analyzed for the purpose of classifying the jobs within the trade and the related material, such as mathematics, drawing, and science, so that the same may be used as material in the classroom for efficient trade instruction. The material was charted and arranged on 3 x 5 cards properly indexed, so that it might be sufficiently flexible for use and for constant revision as the need requires.

NOT MERE SKILL BUT INDUSTRIAL INTELLIGENCE.

Manual Arts Must Educate as Well as Train.

The effect of the war in decreasing the supply of men teachers in the field of manual arts is still felt. Fifteen schools which have been compelled to give up the work during the war period have not yet reestablished their courses. The statistics reported for the year 1920-1921 show a general improvement in the various factors such as pupils, teachers' salaries, etc., involved in the provisions for manual arts courses.

Chiefly as a result of the war's influence the work in Manual Arts has assumed a more definite trend. Purposeful planning took the place of "just teaching" and a wholesome attitude on the part of both teacher and pupils has seemed to develop.

There is evidence, however, of a tendency now to backslide and to revert to the easier "laissez faire" attitude.

Definite Aims and More Effective Technique.

1. In the work at large there is needed more definite aims, recognition of these aims, and such conduct of the work that the needs may be met squarely.

(1) **The development of industrial intelligence;** (2) the acquisition of mechanical skill as an aim but not the primary aim; (3) the work of the first two years of manual training should be explorative ones.

2. Development of industrial intelligence requires definitely assigned reading and study.

3. Certain social and economic studies should be included in the general scheme of the manual arts course.

"They're *the* Best rules made
—I've carried mine *for* many a year"

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"ZIG ZAG"
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A rule MUST BE STRONG, ACCURATE AND LEGIBLE. It is subjected to the hardest kind of usage and must "stand up" under the most rigorous wear and tear.

Stanley Zig Zag Rules will not wear away and loosen at the joints. The Concealed Joint Type has patented Strike Plates at each section — The Rivet Joint Types have a specially made rivet that acts as a Strike Plate. Made in several different styles of markings.

They are made with an especially fine and durable finish.

Among other invaluable and special features are the patented direction arrows enabling the user to tell at a glance which end of the rule to begin using. The Patented tips, joints and Strike Plates are brass plated. Send for Catalog 16-J.

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4. To obtain the best results from such reading and discussion, more attention should be given to the acquisition of a manual arts library, containing not merely technical books but volumes on the historical, economical and political phases of the work.

5. In most schools there should be an effort to get away from the work on the "individual basis" and to emphasize the value of cooperation and altruism. School and community projects will serve as means to this end.

6. Manual arts is a course which, in a peculiar way, should function outside of the schools, in the home or in the community. Most instructors have failed to realize this end and have not utilized the opportunity for practical community service.

7. Teachers should be more keenly aware of the pupil motives which may and should be utilized for effective work in manual arts.

8. There is distinct need for a new organization of the teaching material for the manual arts course. Group work and the problem method should be emphasized. Every teacher of manual arts should recognize the individual differences which exist among students. Individual instruction should aim to encourage originality, initiative and self-reliance.

9. There should be greater variety of subject matter provided for the students of manual arts. In too large a number of schools woodworking is the chief activity provided.

The introduction of more varied instruction—metal work, cement work and electrical work—does not of necessity require an elaborate equipment nor entail a great outlay of money.

10. Mechanical drawing and freehand sketching should function and be used as real tools for the several types of work in the manual arts courses.

11. In the past construction has been pre-eminently the thing to work for. Good design has been neglected. It is imperative that we consider the value of design in every phase of the work.

12. The work in manual arts outlined in this chapter requires adequately trained teachers. These teachers must not merely possess technical training and skill but must have a capacity for open-mindedness and a problem attitude. The effective teacher in this field has transferred his concern from the material product to the "boy product." He must continually add to his professional advancement and must read voraciously if he is to maintain a familiarity with general educational trends.

13. There is much to be done along the line of tests and measurements in the field of manual arts. The best results will probably be obtained along the line of intelligence tests, knowledge tests rather than in those determining norms of mechanical performance or those dealing with accuracy attainment.

H. W. SCHMIDT,
State Supervisor of Manual Arts, Wisconsin.

PERSONAL NEWS NOTES.

Mr. H. N. Seney of Meridian, Miss., has been appointed State Director of Vocational Education to succeed M. H. Broadfoot.

Miss Nellie Whitmore of Seal Harbor, Me., has been appointed head of the cooking department in the vocational school, New Bedford, Mass.

Mr. Harold Baker of Lovelock, Calif., has been appointed vocational counsel for the high school students at San Diego, Calif.

Mr. James R. Burkart and **Mr. Walter Overbeck** have been appointed by the Wisconsin Education Department to assist in the formulation of a state program of vocational education. A four weeks' conference of instructors from representative schools of the state was held in June and the completed program will be compulsory for all schools next year.

Mr. Frank Martin of Petoskey, Mich., has been made assistant in the manual training department of the State Normal School, at Marquette.

Mr. Fred M. Wilcox has recently been appointed chairman of the Wisconsin Industrial Commission to succeed Geo. P. Hambrecht. Mr. Hambrecht has become secretary of the State Vocational Board, succeeding John Callahan, now state superintendent of schools.

Mr. Uel W. Lamkin, retiring director of the Federal Board for Vocational Education, was guest of honor at a farewell dinner given by employes of the board on the evening of July 24th. Commissioner Tigert told of the

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SPECIFY Columbian Vises which include every type or size of wood working or metal working vise and you will get in any Columbian Vise exclusive features which add to adaptability, strength, and easy working qualities, at no higher price than you pay for other vises. Columbian are the only malleable iron vises and are twice as strong as cast iron. The Columbian leg vise (shown in cut) is forged steel without welds in leg or jaws.

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CLEVELAND

MANUFACTURERS' NEWS COLUMN

Take Over Plants. The Greenfield Tap and Die Corporation has recently purchased the Greenfield Machine Company, manufacturers of cylindrical and universal grinders, and the Morgan Grinder Company of Worcester, manufacturers of internal grinders. The two firms which became a part of the Greenfield organization will constitute the machine division of the company. Both plants will be operated in their present location and with their present organization. Eventually, however, the Worcester plant will be removed to Greenfield.

Cumulative Evidence. The Miehle Printing Press & Manufacturing Company has recently issued a tabulation of printing presses purchased by eight large printing firms who have bought presses since the year 1894 and still have each one of their Miehles in operation at the present time. The Miehle Company points to the proud fact that a Miehle printing press has never been scrapped.

Publish New Edition. The demand for the booklet "Chucks and Their Uses" issued recently by the Skinner Chuck Company, has been so heavy that the first edition has been entirely exhausted. A new edition has been prepared and copies will be sent to any reader of the Industrial-Arts Magazine upon request to the home office of the Skinner Chuck Co., New Britain, Conn.

Offer New Series of Lathes. The Standard Lathe Works, Cincinnati, have recently offered for school use their Standard plain engine lathes and have issued a descriptive circular which is of interest to teachers and supervisors. The Standard lathes are of the plain change gear type and commend themselves especially for school use because of their simplicity, accuracy, durability and general "boy-proof" design. They are available in 14 inch and 16 inch sizes with six, eight and ten foot beds. Eighteen inch and twenty inch sizes are also offered with beds up to sixteen feet long. Complete specifications as well as the special circular are available for any interested teacher.

A Sidelight. The recent award of the Prix de Rome to Frank Schwarz, an indigent young artist of New York City afforded a story of human interest. The young man was practically penniless when the notice of the award giving him several years' residence in Rome with a liberal allowance reached him.

As a sidelight of Mr. Schwarz' success it will be interesting to note in the photograph on another page that the successful artist uses a Venus Pencil, manufactured by the American Lead Pencil Company. The picture appears in the advertisement of the firm.

Greenfield Tap-and-Die Issues New Small Tool Catalog. The GTD Corporation, Greenfield, Mass., is now distributing a new catalog describing the small tools and pipe tools which comprise the greater part of their product.

From the frontispiece depicting the plants of the firm, to the seventy or more pages of tables and useful information at the back of the book, this catalog contains a great deal that is of interest to the user and designer of tools and machinery. Some of the tables are new and valuable.

The tools described include screw plates, taps, dies, drills, reamers, milling cutters, bit arbors, countersinks, hobs, tap and drill kits, mandrels, sleeves, sockets, stocks, tap wrenches, pipe vises and pipe wrenches.

A copy of this book will be sent to any teacher.

Mechanical Drawing in High Schools. A survey of conditions in larger high schools of the United States conducted by a committee of teachers in the Cincinnati high schools. This survey was made to ascertain the present practice in teaching mechanical drawing in the larger cities. Questionnaires were sent to 75 high schools and replies were received from 62. The tabulation of replies shows that the greatest possible variety of practice exists and that there is no uniformity in the length of character of courses, in the use of textbooks, hours per week, credits, etc.

The Pittsburgh board of education has recently ordered that Wm. M. McCoy and John B. Stark, field secretaries in the Vocational Guidance Department, shall be employed for one month of the summer vacation to carry on their duties in following up pupils, who have entered employment.

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Bow Divider, Bow Pencil, Bow Pen,
Hairspring Divider
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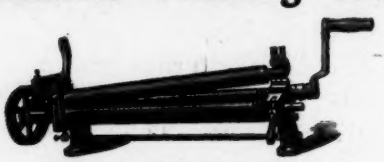

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WE have had many years of experience in fitting out Manual Training Schools with the necessary machines and tools for Sheet Metal Working Courses. If your school has or contemplates such courses, avail yourself of our experience and facilities.

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have become a necessity for every progressive grade, high school, vocational school and college or university. Seventy-five Chicago schools have them already and all the rest want them. Scores of requisitions are in already.

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¶ We can and will gladly supply all information, estimates and suggestions that our experience affords. Write us freely your wants and ideas. Our salesman can call and give you the layout at your convenience. Don't delay; every day increases the benefits of an installed printing plant.

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